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Paul DeMarinis / Buried in Noise

KEHRER

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Vorwort

»Buried in Noise« ist die erste umfassende Monographie über den 1948 in Cleveland, Ohio, geborenen Klang- und Medienkünstler Paul DeMarinis. Sie erscheint anlässlich seines Aufenthalts als Gast des Berliner Künstlerprogramms des DAAD und einer Ausstellung in der daadgalerie, seiner zweiten Einzelausstellung in der singuhr – hoergalerie Berlin sowie der ersten retrospektiven Ausstellung von DeMarinis' Arbeiten im Edith-Ruß-Haus für Medienkunst Oldenburg.

Das Buch dokumentiert Paul DeMarinis' Installationen vom »The Pygmy Gamelan« aus dem Jahr 1973 bis zu den in 2010 entstandenen Arbeiten »Around the World«, »The Probable Flight Path of AF447« und »pneuma«. Des Weiteren versammelt es die wichtigsten, bisher verstreut veröffentlichten und einige unveröffentlichte Texte und Essays des Künstlers. Eingeleitet wird das Buch durch eine Reihe von Aufsätzen und Reflexionen, die das Werk DeMarinis' nicht nur in der zeitgenössischen Klang- und Medienkunst, sondern auch in der Technik- und Mediengeschichte verorten.

Paul DeMarinis hat seine künstlerischen Wurzeln vor allem im Umfeld der experimentellen Sound- und Musikszene, die sich Ende der 1960er, Anfang der 1970er Jahre in Kalifornien herausbildete. Er studierte zunächst Film bei Paul Sharits und dann Komposition bei Robert Ashley am Mills College in Oakland, wo er auch David Tudor und David Behrman begegnete, mit denen er in der Folge mehrfach zusammenarbeitete. Von 1979–82 war er Artist-in-Residence an der Wesleyan University in Middletown, Connecticut, und am Exploratorium in San Francisco, Kalifornien, für das er mehrere wegweisende Arbeiten schuf. Ab 1988 unterrichtete er am San Francisco Art Institute und von 1994–97 war er Artist-in-Residence am Xerox PARC. Seit 2000 ist DeMarinis Professor of Art an der Stanford Universität in Palo Alto. Zu seinen vielen Auszeichnungen und Stipendien gehören u.a. eine Goldene Nica bei der Ars Electronica in der Kategorie »Interaktive Kunst« sowie Fellowships der Guggenheim und der Rockefeller Foundation. 2009/2010 war er Gast des Berliner Künstlerprogramms des DAAD.

Dies sind nur einige biografische Eckdaten zu einem künstlerischen Werdegang, den die hier dokumentierten Werke selbst am eindrucksvollsten nachzeichnen. Das Buch zeigt das außergewöhnliche Oeuvre eines Künstlers, der auf der Höhe des Wissens seiner Zeit und im Moment einer technikbedingten Transformation der Gesellschaft auf diese reflektiert und sie — quasi in Echtzeit — unmittelbar in einen historischen Zusammenhang einzugliedern vermag. DeMarinis interessiert sich gleichermaßen für physikalische Phänomene und die Erfindung und Gestaltung von Objekten und Geräten wie für ihre kulturellen, sozialen und politischen Implikationen. Seine Werke pflegen eine ästhetische Erfindungskultur kritischen, humorvollen und poetischen Geistes und stellen offene Bezüge zwischen Technik, Wissenschaft, Kunst und Kultur, zwischen Geschichte und Gegenwart, Mythos und Wahrheit her. Und nicht zuletzt schreiben sie in ihrer Entwicklung selbst an einem faszinierenden Stück Medien- und Klangkunstgeschichte mit.

Wir danken allen voran Paul DeMarinis, dass er für dieses Buch aus den Tiefen seiner Archive so viel interessantes Material gehoben und die Entstehung der Publikation mit so viel Engagement und Geduld begleitet hat. Gedankt sei auch der Autorin und den Autoren für ihre aufschlussreichen und scharfsinnigen Beiträge. Ferner gilt unser Dank den Gestaltern vom »grafischen buero cyan«, die das vielgestaltige Material in eine so wunderbare Form gebracht haben, sowie Wilfried Prantner, der für den Hauptteil der deutschen Übersetzungen und die Überarbeitung sämtlicher Texte verantwortlich war. Und last but not least danken wir allen Förderern, ohne deren Hilfe diese umfangreiche Publikation nicht möglich gewesen wäre.

[Carsten Seiffarth, Ingrid Beirer, Sabine Himmelsbach]

Foreword

»Buried in Noise« is the first comprehensive monograph on the sound and media artist Paul DeMarinis, who was born in 1948 in Cleveland, Ohio. It is being published on the occasion of his residence as a guest of the Artist-in-Berlin program of the DAAD (German Academic Foreign Service), an exhibition in the daadgalerie, his second solo exhibition in the singuhr – hoergalerie Berlin, and the first retrospective exhibition of DeMarinis' works at the Edith-Ruß-Haus für Medienkunst in Oldenburg.

The book documents Paul DeMarinis' installations, beginning with »The Pygmy Gamelan« from 1973 and extending to the works from 2010 »Around the World«, »The Probable Flight Path of AF447«, and »pneuma«. It also brings together the artist's most important texts and essays, which until now have appeared in scattered publications or remained unpublished. To start off with, a number of essays and reflections locate DeMarinis' oeuvre not only within contemporary sound and media art, but also in the history of technology and media.

Paul DeMarinis' artistic roots are primarily in the experimental sound and music scene that developed in the late 1960s and early 1970s in California. He initially studied film with Paul Sharits and then composition with Robert Ashley at Mills College in Oakland. There he also encountered David Tudor and David Behrman, with whom he later collaborated. From 1979 to 1982, he was an artist in residence at Wesleyan University in Middletown, Connecticut, and at the Exploratorium in San Francisco, California, for which he created several trailblazing works. Beginning in 1988, he taught at the San Francisco Art Institute, and from 1994 to 1997 he held an artist residency at Xerox PARC. Since 2000, DeMarinis has been a Professor of Art at Stanford University in Palo Alto. Among his many awards and stipends are a Golden Nica from the Ars Electronica in »Interactive Art« and fellowships from the Guggenheim and Rockefeller Foundations. In 2009/2010, he was a guest of the Artist-in-Berlin program of the DAAD.

These are just a few biographical details to roughly stake out an artistic career that is most impressively traced by the works documented here. The book shows the extraordinary oeuvre of an artist who, at the forefront of his era's knowledge, reflects the technologically driven transformation of society at the very moment of its occurrence and is able to integrate it directly — in real-time — in a historical context. DeMarinis is equally interested in the phenomena of physics, the invention and design of objects and devices, and their cultural, social, and political implications. His works foster an aesthetic culture of invention with a critical, humorous, and poetic spirit and establish open relationships between technology, science, art, and culture, between history and the present, myth and truth. And not least, as they unfold in these pages, they add their own fascinating chapter to the history of media and sound art.

We thank above all Paul DeMarinis for raising so much interesting material from the depths of his archives and for accompanying the process of this publication with such dedication and patience. We are grateful to the authors for their instructive and perceptive contributions. We also thank the designers from the »grafisches buero cyan«, who put this extremely diverse material into such wonderful form, as well as Wilfried Prantner, who was responsible for the greater part of the German translations and for editing all the texts. And last but not least, we are grateful to all the sponsors, without whose help this extensive publication would not have been possible.

[Carsten Seiffarth, Ingrid Beirer, Sabine Himmelsbach]

The Luminous Ear: An Introduction to the Sounding Visions of Paul DeMarinis

Gascia Ouzounian

The eye may be said to owe its existence to light, which calls forth, as it were, a sense that is akin to itself; the eye, in short, is formed with reference to light, to be fit for the action of light; the light it contains corresponding with the light without. — Johann Wolfgang von Goethe, *Theory of Colors* (1810)

Helmholtz has shown that the fundi of the eye are themselves luminous, and he was able to see, in total darkness, the movement of his arm by the light of his own eyes. This is one of the most remarkable experiments recorded in the history of science, and probably only a few men could satisfactorily repeat it, for it is very likely that the luminosity of the eyes is associated with uncommon activity of the brain and great imaginative power. It is the fluorescence of brain action, as it were. — Nikola Tesla, *On Light and Other High Frequency Phenomena* (1893)

In a 1974 review for the *Village Voice*, the music critic Tom Johnson described a »fascinating electronic instrument« invented by a 25-year old »composer-technician« from the Bay Area. Johnson wrote that the instrument had the potential to change the way people heard music in their cars, although he was careful to note that General Motors would likely not share his enthusiasm.[1] The »instrument« in question was a 1973 sound installation by Paul DeMarinis, *The Pygmy Gamelan:* a collection of small integrated circuits that played 5-note melodies according to electrical fluctuations in the atmosphere. DeMarinis had designed *The Pygmy Gamelan* such that it could be installed in cars, allowing passengers to hear an unprecedented kind of music that reflected changes in the near and distant environment: the movement of people, the propagation of radio waves, the deaths of stars. Johnson was wholly taken with *The Pygmy Gamelan*, citing its »attractive« melodies and the sensitive ears of its inventor, who, while relatively inexperienced, had created a work that was powered by a 12-volt battery and still managed to sound like »a distant gamelan orchestra«. *The Pygmy Gamelan* was DeMarinis' first major work, but its juxtaposition of an »indigenous« music with new technologies signaled his interest in the cultural location of technological innovation, a subject that would shape his work over the next several decades. Its ingenious design equally hinted at an artistic imagination that would profoundly challenge accepted modes of listening to and creating music, and, on a more fundamental level, thinking about sound and communication.[2]

When he created *The Pygmy Gamelan* DeMarinis was still a student at Mills College, where between 1971 and 1973 he undertook an MFA in electronic music and recording media, working primarily at the Center for Contemporary Music (CCM). Under the directorship of Robert Ashley the CCM was a

1 Tom Johnson, »Paul DeMarinis' Pygmy Gamelan (February 14, 1974)« in *The Voice of New Music*, Eindhoven: Het Apollohuis, 1991. Online at *http://www.editions75.com/English/books english.html*

2 Nic Collins makes special mention of *The Pygmy Gamelan* in *Handmade Electronic Music: The Art of Hardware Hacking*. New York: Talyor & Francis, 2006. Collins cites other electronic circuits works by DeMarinis from the period, including *CKT* (1974), in which sensors »responded to a person's electronic field,« and the automatic music composing circuits *Great Masters of Melody* (1975), »one of which could be played by a bird« (DeMarinis's *Parrot Pleaser* from 1974). See Collins, *Handmade Electronic Music*, p. 80.

remarkable, dynamic institution. It had recently incorporated the San Francisco Tape Music Center, which hosted some of the earliest electronic music concerts on the West coast, and which set the tone for a radically experimental approach to composition within an institutional context.[3] In the mid-1970s the CCM gave birth to another radical organization, one that DeMarinis was involved with during the time of its inception: the League of Automatic Music Composers, which incorporated social networks and computer networks (it was the first ensemble to use microprocessors) in positing »new musical artificial intelligences.«[4] During his tenure, Ashley invited many of the leading proponents of experimental music to the CCM. Among them were David Tudor and the composers David Behrman, Alvin Lucier and Gordon Mumma, who along with Ashley formed the Sonic Arts Union — an influential touring collective known for its explorations of acoustic phenomena.

3
See David W. Bernstein, ed., *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde*, Berkeley: University of California Press, 2008.

4
See The League of Automatic Music Composers 1978–1983 at *http://newworldrecords.org*

DeMarinis had the occasion to work with many of these visiting artists, and he cites their unusual generosity in supporting the work of a younger generation of musicians.[5] DeMarinis was among a group of students who helped create the electronic designs for Tudor's *Rainforest IV*, an iconic work in which dozens of suspended, resonating objects act as sound sources and loudspeakers, combining to form a immersive »ecosystem« of amplified sounds and their reflections. With David Behrman, he collaborated on the installation *Sound Fountain* (1982), an interactive work which made use of touch-sensitive sticks that produced music and controlled the movements of digital creatures on a video screen. This work followed on the heels of DeMarinis' *The Music Room* (1981–1982), a groundbreaking installation commissioned by the physicist Frank Oppenheimer for The Exploratorium, a science museum that features interactive exhibits and an illustrious Artist-in-Residence program. When it was unveiled, *The Music Room* signaled a new paradigm in automatic music: it allowed groups of visitors to simultaneously engage in »faultless jamming« (regardless of previous musical experience) by playing touch-sensitive, guitar-like controllers. One of these controlled rhythm, meter, and tempo, and triggered percussive sounds; another played bass lines and coordinated harmonic progressions; two controlled orchestration and melodic figurations, while another played lead.[6] Experienced by hundreds of thousands of people a year, *The Music Room*, which remains part of The Exploratorium's permanent collection, was the first example of an automatic music work to reach a significant audience. Its influence is evident in popular contemporary music gaming systems like *Guitar Hero*, in which multiple players simulate performing lead, rhythm and bass guitar.

5
See Gascia Ouzounian, »Interview with Paul DeMarinis« in *Computer Music Journal* (forthcoming 2010).

6
See »Art at the Exploratorium,« *http://o-art.org/history/80s&90s/Exploratorium/ExplArt.html*

Of his early collaborations, DeMarinis' work with Robert Ashley on the 1974 composition *In Sara, Mencken, Christ and Beethoven There Were Men and Women* is perhaps the most baffling. This composition was a »breathless« setting of a 1944 poem of the same name by John Barton Wolgamot, an otherwise obscure poet who had attained cult status among a group of composers who had become obsessed with his self-published poem — a work that consisted of 128 stanzas, all variations on a single, intentionally meaningless phrase that had taken Wolgamot ten years to compose:

> In its very truly great manners of Ludwig van Beethoven very heroically the very cruelly ancestral death of Sara Powell Haardt had very ironically come amongst his very really grand men and women to Rafael Sabatini, George Ade, Margaret Storm Jameson, Ford Madox Hueffer, Jean-Jacques Bernard, Louis Bromfield, Friedrich Wilhelm Nietzsche and Helen Brown Norden very titanically.[7]

7
See Robert Ashley and Keith Waldrop, J.B.W. (New York: Lovely Music, 2001), online at *http://www.ubu.com/historical/wolgamot/wolgamot.pdf*

In setting Wolgamot's text, Ashley recited each of the 128 stanzas in a single breath, and edited out the breaths in-between stanzas. The result was that of a relentless, mesmerizing vocal outpouring that underscored the complex relationship of the sounds and rhythms of speech to its meanings, and the particular complexities that are engendered when this speech occurs on a scale that is simultaneously human and not. For his part of the composition, DeMarinis used analog synthesizers to create a multi-track electronic accompa-

niment that picked up on particular resonances in Ashley's voice, with the intention of underlining certain »vowel harmonies« in Wolgamot's text.[8] DeMarinis' accompaniment — a mindboggling sequence of regular and irregular pulses, pops, squirts, crashes, shots, glissandos, tones, rumbles, and other evocative sounds — supports, envelops, and eventually overcomes Ashley's voice, which does not fade so much as it becomes a field through its unremitting repetition of meaningless word combinations. DeMarinis credits this collaboration with Ashley (and his own mother's passion for languages) as the roots of his lifelong fascination with speech and language, and in particular the musicality of the spoken word.

Upon graduating from Mills College DeMarinis took a job wiring circuits and making printed circuit layouts for Don Buchla, whose modular synthesizer designs were among the most innovative of the 20th century. From the early stages of his career, however, DeMarinis had little interest in designing instruments — what he considered to be »general purpose paradigms« — preferring to work instead within a culture of visual art that privileged the aesthetics of unique objects. Creating sound works that inhabited this visual arts paradigm would not have been an obvious approach for an emerging artist during this period. The term »sound installation« had just recently been coined by the American artist Max Neuhaus, who used it to describe »sound works without a beginning or an end, where sounds are placed in space rather than in time.«[9] Neuhaus's first sound installation, *Drive-In Music* (1967), was designed, like DeMarinis's *Pygmy Gamelan,* to be heard in cars.[10] Gallery exhibits of sound-based art objects were surprisingly rare before the 1980s, and the term »sound installation« did not enter the general lexicon until that decade. Even early »sound art« exhibits like the Museum of Conceptual Art's *Sound Sculpture As* (1970) — in which a group of Bay Area sculptors were invited to create situations that resulted in sound — owed as much to experimental music traditions as to visual art traditions of the period (these »sculptures« took shape as performances with objects that recalled minimalist Fluxus performances of the 1960s). It was therefore a double leap for DeMarinis to create sound works that took shape as objects but that (1) were not instruments, and that (2) developed outside of musical traditions.

In achieving these disciplinary transgressions, DeMarinis' sound installations often engaged acoustic phenomena in relation to »non-musical« territories (memory, history, technology, science, communication) and in doing so posited new modes of listening to, and otherwise interacting with, sound. In his 1979 installation *Sounds and the Shadows of Sounds,* a computer listens to the sounds of its environment and responds with what DeMarinis calls the »spectral shadows of its memories,« slowly tracing the contours of a remembered soundscape in white noise derived from a police scanner. *Voice Creatures* from 1986 animates three synthetic vocal personalities that inhabit everyday objects (»Ted« and »Bud« are radio-genies, and respectively speak in military alphabetic code and an Elizabethan-era »psychic language«. The husky-voiced »Ramon« lives in the pipes of a kitchen sink, uttering phrases and speaking in codes and moans). Like the computer in *Sounds and the Shadows of Sounds* the voice creatures listen to the sounds of their environment and respond accordingly; when left alone, they converse among themselves, always pausing to listen and evaluate before responding. Both works highlight the listening imperative that is necessary to create dialogue, and the special kind of listening that is required to come into dialogue with an environment: a listening that enables communication (even verbal communication) to move beyond semantics to approach something closer to symbiosis.

The concept of a communication that transcends conventional realms of meaning is one that DeMarinis has explored in various guises throughout his career. In his second work for The Exploratorium, *Alien Voices* (1986), visitors enter two old-fashioned telephone booths and speak to one another over the telephone. As they converse their voices are analyzed and resynthesized through real time signal processing, »translated into music or changed into whispers, robotic monotones or alien melodies«. The result is an unnerv-

8
See Shun'ichi Shiba's 1997 interview with DeMarinis, online at *http://www.stanford.edu/~demarini/shiba.html*

9
Max Neuhaus, *Sound Works, Vol. I: Inscription*, Ostfildern: Cantz Verlag, 1994, p. 42.

10
Drive-In Music consisted of a series of radio transmitters installed at the side of a road in Buffalo that emitted different combinations of sine tones according to changes in environmental conditions; listeners could hear these emissions on their car radios as they drove by the installation.

ing jaunt into a foreign territory where the voice is decoupled from the body, and where words are decoupled from the usual sounds that give shape to their sense.
Alien Voices engenders an awareness of the sound of speech as a social and cultural construct — the unspoken agreements that determine how speech is »supposed« to sound, and the controls that are exerted over the voice in order to meet these normative standards. This work also reveals the performativity of the speaking voice, which not only betrays physical characteristics of the speaker, but equally performs social constructs like gender, race and class through its timbral and tonal variations, rhythmic articulations, and dynamic shifts. *Alien Voices* functions in the opposite direction as well, by highlighting the linguistic underpinnings of music. The listener will hear musical phrases that are reminiscent of spoken ones; the linguistic sense of music — melodic phrases that evolve over the course of a length of a breath, rhythms that reflect the syllabic segmentation of words and sentences — is illuminated through this sudden unfamiliarity of speech.
The musical characteristics of speech had certainly been explored within the context of experimental and avant-garde music in the 1960s and 1970s, notably in the works of Robert Ashley, Luciano Berio, Alvin Lucier, Steve Reich, and Karlheinz Stockhausen. However, *Alien Voices* uniquely proposed an experience of »musical speech« that developed within the context of dialogue, occurred outside the concert listening experience, and had the added dimension of altering the speakers' perceptions of body, self and other by revealing the uncanny potential of the voice.
DeMarinis' inquiry into the »duality of sound and meaning« that is figured in speech underlay his 1990 album *Music as a Second Language*, perhaps the most extensive exploration of synthesized speech and speech melodies ever undertaken. The album collects eight compositions. The first of these, »*Leçon par l'aiguille*,« features an untouched recording of a French language lesson from the 1930s. The instructor's drawling vowels and hyper-articulated words — a meaningless sequence of isolated phonemes and terms (»oooh« »oh« »oh« »mode« »note« »bouquet«) spoken at regular intervals — are drawn into a duet with an electronic instrument that follows his speech. This piece is followed by »*Fonetica Francese*,« which presents a modern take on the French language lesson. A synthesized voice mimics the linguistic gestures heard in the previous track; it is set against an electronic accompaniment that renders its meaningless utterances emotionally potent, the shifts in the listener's emotional response mirroring those in the attendant harmonies. The penultimate track, »The Power of Suggestion,« sets the synthesized voice of a hypnotist against intricate rhythmic patterns played over electronic bells and vibraphone. The hypnotist coaxes the listener to give in to a »relaxing power,« and eventually lulls the listener to sleep:

> Your body... is now... relaxed... all over... in every... way... and your mind... is relaxed... and filled... with peace... [...]
> As you listen... to the sound... of my voice... and the soothing... beat... of the metronome... you feel... a very... pleasant... feeling... of relaxation... coming over... your entire... body... As this feeling... of peace... and relaxation... increases... you will find... yourself... going deeper... and deeper... asleep... Each... beat... takes you deeper... and deeper... asleep...

At the opening of the session the hypnotist's voice is neutral and even-toned, but it becomes increasingly expressive, almost pleading with the listener to let go in its final moments. Incredibly, by the end of the track, the voice ceases to sound synthetic. Through subtle shifts in pitch and dynamics (and shifts in the listener's increasingly altered perception), the voice continues to sound like itself, but somehow more human.
The hypnotic voice is featured in several of DeMarinis' works, most prominently in his 2007 installation *Hypnica*, in which specially designed metronomes equipped with optical interrupters and MP3 devices transmit the voices of hypnotists along with a soundtrack of even metronome clicks. The particular characteristics of the hypnotic voice make it well suited to occupy

the region that DeMarinis has eloquently demarcated (and subsequently erased) between speech and music. Like the singing voice, the hypnotic voice performs. It is unnatural — carefully constructed and precisely controlled — while appearing to sound unrehearsed and inviting. It begs the question, what exactly makes a voice sound convincing? Knowledgeable? Trustworthy? Furthermore, the hypnotic voice performs a function that is usually reserved for the musical voice: it invites the listener to enter an altered state (one that is distinct from everyday experience) wherein the imagination rules. It is within this altered state that the listener can access an ancient, pre-linguistic sense of hearing wherein sound conveys meaning in its very essence, separate of linguistic signs and signifiers.

By providing a continuous point of aural fixation, the hypnotic voice brings about a state of receptive unconsciousness. The listener can receive and process aural information, can reveal and alter the machinations of the subconscious mind, but cannot conceivably act outside the hypnotist's will. In the context of a hypnosis session, the listener enters into this state of vocal remote control by agreement. However, the power of the voice to mesmerize the listener appears in other, considerably more precarious contexts that are also of interest to DeMarinis, who has written that, »as our leaders talk, hearing not the words but the music, we sing our quiet selves into a sleep of understanding.« In *Firebirds* (2004), DeMarinis constructs omnidirectional loudspeakers out of the most alluring and ghostly of materials — flames — and uses these to transmit recordings of speeches by 20th-century dictators and politicians who rose to power during the interwar period. Voices belonging to Joseph Stalin, Adolf Hitler, Franklin Roosevelt and Benito Mussolini are literally caged in *Firebirds*, held captive within birdcages »[that act as] enchanted prison cells in the afterlife for voices that wielded enormous political power during their lifetimes.« That these voices appear in 3D — they are equally audible and visible from all sides — further subverts the power relationships between these speakers and their modern audiences; listeners can observe each voice from any angle, can circle the speakers in a manner typically reserved for those who occupy a position of power. The flame itself, which DeMarinis views as a metaphor for speech, (»the image of an individual voice that could be blown out in a puff, but could also ignite the world«) represents a high-voltage, seemingly impossible, and potentially lethal marriage of sound and vision.

The division of the senses — a cultural phenomenon that DeMarinis locates within the sense-specific technological innovations of the Victorian era (the phonograph, the binocular), the obsession of Victorian science with isolation and reduction, and its consequent obsession with hybrids that attempt to reunify the senses (the sound cinema) — are brought to the foreground in his 1995 installation *Gray Matter*, which revives an improbable instrument from the period: the musical bathtub. In 1874, the American electrical engineer Elisha Gray happened upon his nephew creating what were literally shocking sounds (he achieved this by simultaneously holding a rheotome — a circuit-breaking instrument — and stroking the zinc lining of a bathtub). *Gray Matter* revisits this phenomenon, one that DeMarinis himself happened upon by chance. In *Gray Matter* DeMarinis connects objects and acoustic instruments (a bathtub, a double bass mounted on a ceiling, two violins mounted on walls) with long, brass harpsichord wires. When the wires are stroked, they function as acoustic resonators while also transmitting an electrical charge to the listener's body, which becomes the site for a sonic experience that ranges from the electrifying to the painful to the sublime. DeMarinis writes:

> As we stroke the wires of *Gray Matter*, we both feel as texture and hear as sound the faint electrical stirrings within the wire — melodies, scales, creakings and glissandi inhabit a world in which touch and hearing are for a moment unified.

Gray Matter compels an embodied listening — what the musicologist Andra McCartney has called »a full-bodied hearing« — that puts the entire body on

11
Andra McCartney, »Soundscape Works, Listening and the Touch of Sound« in *Aural Cultures*, ed. Jim Drobnick, Toronto: YYZ Books/Banff: Walter Phillips Gallery Editions, 2004, p. 179.

12
Gascia Ouzounian, »Embodied Sound: Aural Architectures and the Body,« in *Contemporary Music Review* 25/1–2 (2006), p. 73.

equal ground with the ears.[11] »With their bodies acting as conductors of acoustic and electrical energy, listeners must turn their sonic gaze inwards, and in the process re-imagine their bodies as sites wherein sounds can resonate, rather than as neutral, unengaged receivers.«[12] In a manner not dissimilar to the shifts in body perception engendered through vocal transformations in *Alien Voices*, the body-image and the sound-image are commingled in *Gray Matter*, drawn into a seemingly invented, but altogether more real, relationship.

DeMarinis' interest in obscure and arcane realms of sound transmission (the flame loudspeaker, the musical bathtub) is matched by his attention to the unexpected residues of sound recording. His most widely exhibited work, an extensive series called *The Edison Effect* (1989–96), returns once again to the »shadows of sound,« collecting an unlikely assortment of artifacts, media, and living creatures: ancient phonographs, laser beams, holograms, ceramic plates, a clay vessel, a sewing machine, a flashlight, goldfish. These combine in various ways to enable the playback of pre-recorded but previously unheard sounds. The beam of a flashlight is used to play a recording of Laurie Spiegel's album *The Expanding Universe* (a selection from which was launched into space aboard the Voyager probe in 1977), evoking an imagined future listening of the work. A laser beam is used to play back the oldest known sound recording, captured in the grooves of a clay cylinder. A sewing machine equipped with a laser is set to the task of replaying a recording that is abstracted as an image (of an audio file) and subsequently woven into fabric. In *The Edison Effect*, surface becomes depth: the medium of recording is inverted and subverted through the precision-scanning of laser beams and other optical devices that bestow potency upon sounds that were never meant to be heard, and impotence upon sounds that were. In the process these undomesticated playback devices raise some critical questions: at what expense do we retain certain memories and discard others? How is the value of memory determined, and by whom? What is captured and what is lost in the record of an event (historical, musical or otherwise)? Desired and unwanted? How do we arrive at these calculations, and what do these calculations tell us about ourselves, and about our social and cultural milieux?

The Edison Effect, in which sonic information is ascertained through the use of optical devices, also evokes the (now defunct) extramission theory of vision, which proposed that the eye is able to see by emitting light. As DeMarinis writes, »The central image in *The Edison Effect* is of the fusion, or conflation, of looking and listening. The beam of a laser for me is much like the visual ray that was, in ancient times, believed to emit from the eye, permitting the viewer to see by touching with his eyes.« The theory of extramission was popular in ancient cultures — DeMarinis suggests that it may shed light (no pun intended) on Plato's allegory of the cave — but it surprisingly retained currency in more contemporary times as well. In 1810, Johann Wolfgang von Goethe suggested that color is derived from the interplay of lightness and darkness, and that extramission is involved in the perception of color. In an 1893 article, the scientist Nikola Tesla posited that extramission was a result of a fluorescent brain reserved for those with »great imaginative power.« In *The Edison Effect* the eye becomes a hearing device, and the ear becomes, as it does in many of DeMarinis' works, luminous, imbued with the light of a great imaginative power that illuminates everything it hears.

The luminous ear confounds the culturally derived separation of sound from that which gives rise to it — the body, the environment, action, the unconscious, a desire for communication; it releases sound from a history of hearing that prefers to keep sound within the confines of musical notation, infinitely reproducible recordings, conventions of speaking and listening, and other conceptual cages. The luminous ear sees sound as something that connects listeners to their surroundings, their futures and their pasts; it allows listeners to hear sound by »touching with their ears,« enabling a point of contact that moves beyond the physical and the material to include the uncanny, the alien, and the forgotten.

The luminous ear detects even the most distant and inaudible of sounds, even the sound of a flame that has been extinguished. In DeMarinis' light of hearing, the flame is a voice that, even when it has faded, continues to resonate, transformed into an echoic memory that lives in the surfaces and grooves of an infinitely reflective mind.

Das lumineszente Ohr: Eine Einführung in Paul DeMarinis' klingende Visionen

Gascia Ouzounian

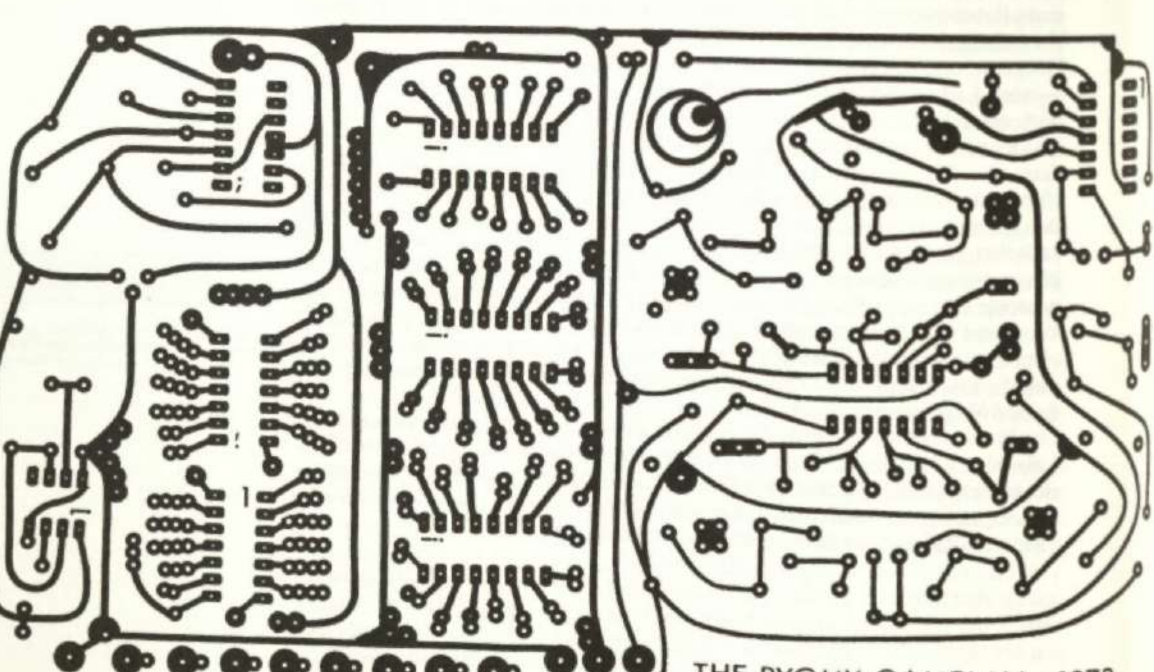
Das Auge hat sein Dasein dem Licht zu danken. Aus gleichgültigen tierischen Hilfsorganen ruft sich das Licht ein Organ hervor, das seinesgleichen werde; und so bildet sich das Auge am Lichte fürs Licht, damit das innere Licht dem äußeren entgegentrete. — Johann Wolfgang von Goethe, *Farbenlehre* (1810)

Helmholtz hat gezeigt, dass die Netzhaut selbst Licht aussendet, und konnte selbst bei vollkommener Dunkelheit mit dem Licht der eigenen Augen die Bewegung des eigenen Armes sehen. Dies ist eines der bemerkenswertesten Experimente in der Geschichte der Wissenschaft, das vermutlich nur wenige erfolgreich wiederholen können, denn aller Wahrscheinlichkeit nach hängt die Leuchtkraft der Augen mit ungewöhnlicher Hirnaktivität und großem Vorstellungsvermögen zusammen. Sie ist sozusagen die Fluoreszenz der Geistestätigkeit. — Nikola Tesla, *Über Licht- und andere Erscheinungen hoher Frequenz* (1893)

In einer Besprechung für die *Village Voice* beschrieb der Musikkritiker Tom Johnson 1974 ein »faszinierendes elektronisches Musikinstrument«, erfunden von einem 25-jährigen »Komponisten-Techniker« aus der Bay Area. Dieses Instrument, schrieb Johnson, habe das Potenzial, die Art, wie wir im Auto Radio hören, zu verändern, merkte allerdings auch an, dass General Motors diese Begeisterung vermutlich nicht teilen werde.[1] Das »Instrument«, von dem er sprach, war eine Klanginstallation von Paul DeMarinis aus dem Jahr 1973: *The Pygmy Gamelan*, eine Ansammlung kleiner integrierter Schaltkreise, die in Abhängigkeit von atmosphärischen Veränderungen fünftönige Melodien erzeugten. DeMarinis hatte das *Pygmy Gamelan* für den Einbau in Autos entworfen, wo es den Passagieren eine bislang unbekannte Form der Musik zu Gehör bringen sollte, eine Musik, die Veränderungen in der näheren und ferneren Umwelt registriert: die Bewegungen von Menschen, die Ausbreitung von Funkwellen, den Tod von Sternen. Johnson war hin und weg vom *Pygmy Gamelan*, schwärmte von seinen »reizvollen« Melodien und dem feinen Gehör des Erfinders, der mit seiner relativen Unerfahrenheit ein Werk geschaffen habe, das, obwohl nur mit einer 12-Volt Batterie betrieben, klinge wie »ein fernes Gamelanorchester«. *The Pygmy Gamelan* war DeMarinis' erste bedeutende Arbeit, signalisierte aber mit ihrer Juxtaposition einer

1 Tom Johnson, »Paul DeMarinis' Pygmy Gamelan (February 14, 1974)« in: *The Voice of New Music*, Eindhoven: Het Apollohuis 1991. Online unter: *http://www.editions75.com/English/books english.html*





THE PYGMY GAMELAN - 1973

The Pygmy Gamelan as Technology of Consciousness

Fred Turner



In 1973, Paul DeMarinis built a very peculiar device. It looked a little like a car radio that had been removed from the dashboard. The front panel featured tiny lights, along with drawings of a farm, a tractor, and a truck. Behind the panel there lurked a circuit board, its wires poking out here and there, waiting to be connected to an amplifier and a set of speakers [see detail above]. DeMarinis labeled his creation »The Pygmy Gamelan '73.« At the time, he described it thus:

> *The Pygmy Gamelan* is an installation piece … which responds to fluctuating electrical fields (generated by people moving around, radio transmissions, the births of distant stars and galaxies) by changing the patterns of five-note melodies it plays. The integrated circuits used in *The Pygmy Gamelan* are all inexpensive surplus items originally intended for consumer products. Their use here, however, is purely folkloric and tends, like the hand-carved plastic artifacts which must circulate in primitive societies, to refer to a culture other than that of high technology.[1]

From a distance of almost forty years, the *Pygmy Gamelan* begs a series of archaeological questions: Under what cultural conditions did it seem so important to create tools with which to transform the electric energies of the universe into patterns of sound? And why did DeMarinis feel compelled to announce that he had repurposed consumer technologies? In what possible sense was this tangle of wires and plastic »folkloric« or »primitive?« And what if anything did it have to do with African pygmies, Indonesian gamelan players, or for that matter, American tractors and barns?

To get some purchase on these issues, we need to revisit the social and intellectual world in which the *Pygmy Gamelan* was made. In the early 1970s, DeMarinis was living in Berkeley, California, at the center of a decade-long intermingling of new media artists, psychedelic experimentalists, computer technologists and back-to-the-land communalists. In 1968, for instance, he was hanging out at the Center for Contemporary Music at Mills College — a gathering point that had just that year grown out of the region's pre-eminent locus of sonic and psychedelic experimentation, the San Francisco Tape Music Center. One of the Center's founders, Ramón Sender, had recently left the city for one of its most famous communes, Morningstar Ranch. Over the next few years, DeMarinis lived in a cooperative house with roommates who ranged from computer programmer Richard Steiger to filmmakers George Landow and John Schofill, creator of the weekly film series Cinema Psy-

1 Quoted by Paul DeMarinis, personal communication, October 4, 2009.

chedelica. And DeMarinis studied with composer and new music festival organizer Robert Ashley, who had collaborated with key members of the Tape Music Center, as well David Tudor, Gordon Mumma, and David Behrman.[2]

Despite their diversity, the communities these individuals represented tended to share a broad vision of the politics of technology. On one hand, like other Americans in the late 1960s, they had inherited a scathing mid-century critique of large-scale machinery. In the wake of World War II, many had come to fear what President Dwight Eisenhower called »the military-industrial complex.«[3] America's nuclear assaults on Japan, coupled with its emerging fear of Soviet nuclear attacks, had left American intellectuals and ordinary citizens alike particularly preoccupied with the atomic bomb.[4] Nuclear weapons seemed to represent a deep dehumanization of international relations. What's more, they seemed to represent the apogee of the American high-technology production system. To many, they were not simply weapons; rather, they embodied the values of a society gone awry.

By the mid-1960s, this view had become one part of a broader attack on what Jacques Ellul called »the technological society« and what Theodore Roszak, in his exceptionally influential 1969 book *The Making of a Counterculture*, called »technocracy.«[5] These critiques agreed on two points: that large-scale technologies grew out of and reflected the values of large-scale bureaucracies; and that both such organizations and their machines tended to dehumanize the men and women who worked around them. According to critics such as Roszak, for instance, America's political and economic leaders had succumbed to a state of hyper-rationalization, a deep disconnection from their emotions, from their bodies, and from nature itself. Large-scale technologies both embodied and perpetuated this fractured state of consciousness. And nothing made the consequences of such a mindset more painfully visible to draft-age Americans than the burgeoning war in Vietnam.

On the other hand though, the same big American industries lately responsible for the technologies of war had also brought post-World War II American youth all sorts of new pleasures. Cheap, ubiquitous cars in which to go cruising, portable record players to which to dance and, by 1965, perhaps science's greatest gift to the San Francisco Bay-area counterculture, LSD — for the children of the cold war these new consumer technologies offered types of pleasure almost entirely unavailable to their Depression-era parents. These technologies in turn presented a generational quandary: How could the young citizens of the 1960s reform the psychologically divisive and biologically disastrous military-industrial core of American society without giving up the technological pleasures it offered?

In northern California, many turned to the autodidact engineer Buckminster Fuller for answers.[6] Since the 1930s, Fuller had made his living at the edges of American industry. He had built a three-wheeled car, designed a house on a pole (to be dropped, whole and spear-like, from airplanes), and most famously, he had patented the geodesic dome. In 1949, he drafted an essay outlining what he believed to be the proper relationship between the individual and industrial technologies. Reprinted in 1963 under the title »Comprehensive Designing,« and cited repeatedly in subsequent years as Fuller lectured across the country, this essay presented a philosophy and a set of tactics that would transform industrial technologies into tools for saving the world.

According to Fuller, large-scale industries did their engineering work within parameters set by the natural world. Their products thus belonged in some sense to the world as a whole. Yet politicians and industrialists hoarded their valuable designs, seeking individual organizational advantage at a time of deep human peril. Poverty in particular, argued Fuller, stemmed from the failure of current social structures to adequately distribute the benefits of industry. To solve this problem, Fuller advocated that individuals step outside the boundaries of individual organizations, take a view of the whole of humanity, and repurpose the products of American industry for the good of the species. This new kind of individual would be a »comprehensive design-

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All biographical information comes from Paul DeMarinis, personal communication, November 23, 2009.

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Dwight D. Eisenhower, »Farewell address by President Dwight D. Eisenhower, January 17, 1961; Final TV Talk 1/17/61 (1),« Box 38, Speech Series, Papers of Dwight D. Eisenhower as President, 1953–61, Eisenhower Library; National Archives and Records Administration. Available *http://www.ourdocuments.gov/doc.php?flash=old&doc=90*, December 29, 2009.

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See Paul S. Boyer, *By the Bomb's Early Light: American Thought and Culture at the Dawn of the Atomic Age*, Chapel Hill: University of North Carolina Press, 1994; Spencer R. Weart, *Nuclear Fear: A History of Images*, Cambridge, MA: Harvard University Press, 1988.

5
Jacques Ellul and John Wilkinson, *The Technological Society*, New York: Knopf, 1964. Theodore Roszak, *The Making of a Counter Culture: Reflections on the Technocratic Society and Its Youthful Opposition*, Garden City, NY: Doubleday, 1969. For more on this point, see Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*, Chicago: University of Chicago Press, 2006, p. 28–39.

6
See Fred Turner, »R. Buckminster Fuller: A Technocrat for the Counterculture,« in: *New Views on R. Buckminster Fuller*, edited by Hsiao-Yun Chu and Roberto Trujillo, Stanford, CA: Stanford University Press, 2009, p. 146–59.

er,« he explained.[7] Thanks to new media technologies and to the rise of science and industry more broadly, individuals could now access information about the range of the world's resources more easily than ever. The comprehensive designer was to use that information to identify key technologies and social trends. He was then to turn the products of industry away from the uses of particular bureaucracies — and thus away from the organizations most menacing to the health of the planet in Fuller's view — and toward helping the individual and the world as a whole. As Fuller put it,

> If man is to continue as a successful pattern-complex function in universal evolution, it will be because the next decades will have witnessed the artist-scientist's spontaneous seizure of the prime design responsibility and his successful conversion of the total capability of tool-augmented man from killingry [sic] to advanced livingry [sic] — adequate for all humanity.[8]

Here then, we can begin to glimpse some of the ideals informing the *Pygmy Gamelan*. At its core, the Gamelan depends on what Fuller would have called a »seizure of the prime design responsibility.« DeMarinis has appropriated the same wiring and the same circuits that supplied mainstream Americans with their consumer technologies and for that matter, their weapons. He has transformed them into tools for extending the individual's senses. Like a radio, the Gamelan tunes in frequencies of electronic activity that are otherwise invisible. Yet unlike a radio, it orients the listener to patterns of energy far beyond the control of corporate America. Its five-note melodies sound the invisible forces of the universe, the same forces that affect humans as a species. At the same time, they do so using a small device, an individual, even personal module.

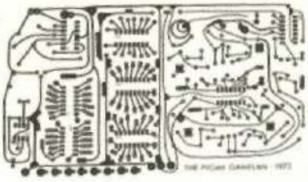
The Gamelan then, brings the tools of American industry to bear on a new project: the enhancement of individual consciousness, and more particularly, of the individual's awareness of cosmic forces. If the domino theorists of the military-industrial establishment sought to use technologies to rule the globe by force, the Gamelan invited its users to enter to explore natural forces, to get to know the world from within, using only their own, extended senses. For all its technological savvy, the Gamelan appears to have been a deeply pacifist device.

At the time, its focus on extending the senses also echoed the strategy of a new form of politics. In the late 1960s, even as the anti-war marchers of the New Left took to the streets, many in the San Francisco Bay area turned inward. In their view, politics as a party-based affair had gone bankrupt. For the communalists and the alternative technologists of the Bay area, the structure of governance wasn't at the center of America's social ills; consciousness was. As thinkers such as Theodore Roszak had explained, psychological fragmentation and the fracturing specialization of bureaucracy were one; together they had loosed the machinery of war. The communards of San Francisco embraced a contravening logic: drawing on Fuller's theories of comprehensive design, they hoped to turn the master's tools on the master himself. They would build the products of the American industrial behemoth into small devices. With them, they would extend the intellectual and emotional capacities of their users. Thus transformed, these individual minds would gather together into new kinds of groups — collectives, rather than bureaucracies — and society itself would find a new foundation.

Together with Fuller's theory of comprehensive design, this view helped spawn an entire class of devices from the late 1960s and early 1970s, devices that we might call »technologies of consciousness.« By 1973, individual San Francisco-area artists and scientists had turned all sorts of industrial products into tools for reshaping their users' minds and with them, their habits of community. On communes across the west, refugees from the city hacked the roofs off junked automobiles or gathered scraps of plywood, plastic sheeting and steel, and tacked them together into geodesic domes. In Berkeley, the renegade computer scientists of the Resource One computer center took machines created to handle industrial and military data and put them in a record

7
R. Buckminster Fuller, »The Comprehensive Designer,« manuscript of 7 pages, June 1, 1949. Buckminster Fuller Archive, Manuscript File 49.06.01; repr. in *Your Private Sky: R. Buckminster Fuller, Discourse*, ed. by Joachim Krausse and Claude Lichtenstein Baden: Lars Müller, 2001, p. 243–46. Fuller published an expand-ed version of this essay under the title »Comprehensive Designing,« in: *Trans/Formation* 1, no. 4 (1950): 18–23. This expanded version was reprinted in R. Buckminster Fuller, *Ideas and Integrities: A Spontaneous Autobiographical Disclosure*. ed. Robert Marks. Englewood Cliffs, NJ: Prentice-Hall, 1963, p. 173–82.

8
Fuller, *Ideas and Integrities*, 249.





Birch Bark Crib, Smith, J.D., and Hal Hershey, eds. *Whole Earth Catalog One Dollar.* Menlo Park, CA: Portola Institute, September, 1970, page 32. Used by permission of Stewart Brand.

store, to serve as what they called »Community Memory.« And in the dance halls of San Francisco, musicians and light-show designers turned their new abilities to amplify sound and light into techniques for expanding the minds of dancers and acidheads.

These technologies shared certain properties. First and foremost, they fused high technology products to natural processes. LSD did this most directly: when a user placed a little tab of acid-infused paper on his tongue, for instance, he turned his body into a laboratory. But other products worked this trick as well. In 1970, for example, the era's foremost compendium of countercultural tools, the *Whole Earth Catalog*, presented a birch bark and Plexiglas crib. Its makers had fused a quintessential consumer toy from the era, the plastic snow saucer, to a ring of birch bark. They had cut holes in the birch bark so that the baby could see out, and covered them with industrial plastic. They had then covered the saucer with leather for good measure. The makers explained that the resulting high-tech/low-tech/organic materials hybrid would give »a child the chance to control and make their own universe, and see it as well.«[9]

9
J.D. Smith and Hal Hershey, eds., *Whole Earth Catalog One Dollar*, Menlo Park, CA: Portola Institute, September, 1970, p. 32.

In other words, it would help the child become a comprehensive designer. Throughout the San Francisco Bay area at this time, small-scale technologists were pursuing similar aims. Perhaps the most famous example of the comprehensive design ethos remains the first Apple computer, the Apple-1, built by Steve Wozniak, a member of the Homebrew Computer Club. Like

the makers of the birch-bark crib, Wozniak gathered key elements of his project from commercial and military industry: circuit boards, microchips, and wires, for instance. Like Fuller's comprehensive designer, he then played both scientist and artist. He transformed the products of industry into a device that would in turn extend his own intellectual access into realms of otherwise invisible energy and data. And in that sense, he helped redistribute the wealth of knowledge and value concentrated in America's military industrial complex at the time. The northern California Byte Shop stores that were the first to sell his new computers extended the countercultural production logic behind them by having a local carpenter build koa wood cases for the models in their stores.[10]



The Apple-1 computer. Used by permission of the Smithsonian Institution.

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Michael Moritz, *The Little Kingdom*, New York: William Morrow and Company, Inc. 1984, p. 147–49; Stan Veit, *Stan Veit's History Of The Personal Computer*, Asheville, NC: Worldcom, 1993, p. 89–98. Moritz and Veit cited in Steven Weyhrich, »The Apple-1,« *http://www.apple2history.org/history/ah02.html#x14*. Accessed January 5, 2010.

Perhaps this impulse explains the pictures of the tractor and the farm on the front panel of the *Pygmy Gamelan*. For all their high technology, the Apple-1, the birch-bark crib, and even LSD came to popular life in a social world devoted to finding an alternative to a militarized, bureaucratic way of life. They each presented different tactics with which to reform their users' consciousness: to the acidheads of San Francisco, LSD offered the experience of melted psychological boundaries and the feeling of oneness; to rural communards, the birch-bark crib offered a way to put oneself between industry and nature, and to build an artifact that unified the two realms. In its time, the Apple-1 also offered much more than a simple hobbyist's experiment. It presented a chance to repurpose high technologies and so to extend the individual's reach into the universe of information. Encased in natural wood, its circuits tracked the invisible flow of energy through the natural world, as electricity, and through the social world, as information, and it put its user at the center of both.

In that sense, perhaps the Apple-1 was a *Pygmy Gamelan* too.

The Pygmy Gamelan als Bewusstseinstechnologie



Fred Turner

1973 baute Paul DeMarinis ein eigenartiges Gerät. Es sah aus wie ein aus einem Armaturenbrett ausgebautes kleines Autoradio. Auf seiner Frontplatte befanden sich kleine Lämpchen und Zeichnungen von einer Farm, einem Traktor und einem LKW. Dahinter saß eine Platine mit einer Schaltung, aus der da und dort Drähte ragten, als warteten sie bloß darauf, an einen Verstärker und ein paar Lautsprecher angeschlossen zu werden [siehe Detail oben]. »The Pygmy Gamelan '73« nannte DeMarinis diese Arbeit, die er seinerzeit wie folgt beschrieb:

> *The Pygmy Gamelan* ist eine Installationsarbeit […] die auf elektrische Feldschwankungen (ausgelöst durch herumgehende Menschen, Funkwellen oder die Geburt neuer Sterne und Galaxien) mit Veränderungen

Thinkering with Media: On The Art of Paul DeMarinis

Erkki Huhtamo

Fragments of Jericho (1991), one of the thirteen machinic »sculptures« in Paul DeMarinis' installation *The Edison Effect*, challenges the observer to re-imagine the aural dimension of history.[1] A cracked clay pot, purportedly a remains from some defunct civilization, rotates on an old turntable. By sweeping its surface with a laser beam, the exhibition visitor gets to hear scratchy, barely audible sounds preserved in its grooves (pygmies singing, as far as I can recall, placed there by the artist with a secret method). What if, the work asks, sounds of ancient civilizations had been preserved — perhaps accidentally — in ornamental clay pots (or decorated ceramic plates or even woven fabrics)?[2] What if the silence of the past was only caused by our inability to play it back? Of course, there are other references. The clay pot also evokes the cylinders used for recording, storage and playback in Edison's phonograph (1877). The laser beam (the immaterial »needle« of CD players) meets the phonograph cylinder on a gramophone turntable — all mixed into a paratemporal soup that merges past and present, reality and fantasy.

In a long and impressive line of works, DeMarinis has re-created the past in the form of alternate realities, challenging received notions about the »real« history of sound technology. In one of his essays he criticizes the role assigned to technology: »There is a popularly promoted belief that technology drives culture forward, and that our changing relationships to one another, material and informational, are the result of advances made by science and are manifested in the development of new materials, processes and tools.«[3] Referring to Deleuze, DeMarinis concludes that »tools exist only in relation to the interminglings they make possible or that make them possible.« The technologies for recording, reproducing and transmitting sound are never »pure.« They have no existence independent of those cultural discourses that precede them, affect them and envelop their »lives« in changing cultural, ideological, social and economic circumstances.

DeMarinis is a master tinkerer, a highly sophisticated *bricoleur* who creates amazing experiences from »tecnologia povera.« Using anything at hand, from secondhand electronic components, old record players, radios and electric guitars to datagloves, he constructs artwork-machines that sing and speak and resonate — emotionally, intellectually and culturally. An example is a piece called *Four Foxhole Radios*, an ambiguous commentary on human inventiveness in dire circumstances (like a concentration camp), and the need to overcome isolation. The work consists of functioning radio receivers created by applying burnt out light bulbs, mesquite barbeque charcoal, rusty batteries, eighteenth century nails, packs of chewing gum, discarded CD's, votive candles, whisky bottles and shot glasses.

1
This essay is based on two earlier texts: »Excavating Sounds: On the Art of Paul DeMarinis,« in: *Excavated Sounds. The Media Art of Paul DeMarinis*, ed. Päivi Talasmaa, Espoo: Otso Gallery, 2000, p. 10–15, and »An Archaeology of Networked Art: A Symptomatic Reading of The Messenger by Paul DeMarinis,« in: *Networked Narrative Environments*, ed. Andrea Zapp, Manchester: Manchester Metropolitan University, 2004, p. 32–44.

2
DeMarinis has explored the two latter possibilities in works titled *Dinner at Ernie's* (1995) and the *Singer of Songs* (1996).

3
Paul DeMarinis, unprinted statement for Paul DeMarinis Exhibition, Center for the Arts, San Francisco, 1995, reprinted in this volume as »Gray Matter«, p. 225–226; here p. 225.

DeMarinis draws inspiration from seemingly obsolete forgotten artifacts. Once he found a series of old 78rpm recordings of Stalin's speeches from a junk store in Tallinn, Estonia. Stalin's short, faint utterances, »like uninhabited islands somehow lost in a sea of embarrassing pauses, now filled in by the oceanic roar of cheap Soviet bakelite,« as DeMarinis himself put it, gave him an opportunity to reflect on media and power, and also on those fragile supports that have preserved these sounds and carried them from the no-longer existing Soviet Union to the new Millennium.[4] DeMarinis' practice is far from reckless postmodern play with the residues of culture. For him, seemingly obsolete ideas and devices provide opportunities to re-connect with the past, but never in simplistic and straightforward ways. His works are elements in an evolving dialogue between the past, the present and the future, an open-ended discourse that uses artwork-machines as its words and sentences.

4
Paul DeMarinis, description of the artwork *The Lecture of Comrade Stalin at the Extraordinary 8th Plenary Congress about the Draft Concept of the Constitution of the Soviet Union on November 25, 1936*, reprinted in this volume, p. 231–233.

Besides being a tinkerer, DeMarinis is therefore also a »thinkerer« — an intellectually oriented artist, whose inventions reflect on wider cultural frames of reference. Over and over again, but in many different guises, his work demonstrates that the history of media technology does not comprise only those inventions and ideas that materialized as actual, commercially marketed artifacts or as institutional systems of communication, but also those dreams and visions that existed but were never »realized.« They are an equally important part of our »technological unconscious.« As an artist DeMarinis' interests are very close to those of media-archaeologists, who are excavating the past to uncover alternative — suppressed, neglected, forgotten — histories of media and technology. Their mission runs counter to dominant historical narratives that emphasize progress and teleological models, and are often based on deterministic arguments about technology as a prime mover of culture.

Looking back from our contemporary observation post, we tend to take notice only of those inventions we identify as direct predecessors of the devices surrounding us today. We often remember only the inventions and visions that »took effect«; those that did not are — unjustly — committed to oblivion. Media-archaeologists have pointed out that such a point-of-view misses something essential. The history of technology is a complicated process with many false promises, surprising turns and dead ends (real or assumed). Visionaries and inventors work within the fabrics of their times; as groundbreaking as their intuitions may have been, they often stem from ideas or desires that have been »in the air.« The practical applications they propose may prove to be quite different from those that eventually came to dominate in the frameworks of industrial and institutional developments. No matter how *clairvoyant* they may be, the visions of these visionaries are often blurred by the complexities of the circumstances; it is difficult to predict all the factors that come to affect the fates of their inventions.

As DeMarinis has demonstrated, there is an »incredible variety of possible technologies that have fallen along the wayside.« Some ideas were forgotten because they were impractical, while others could have been adopted had the circumstances been different. The installation series *Gray Matter* (1995) was inspired by such a case, that of the American inventor Elisha Gray, the unlucky pioneer of telephony, who is said to have submitted his patent application for the telephone only hours after the winner, Alexander Graham Bell, on February 14, 1876. Gray proposed an unusual way of producing and transmitting sound. By connecting an electric rheotome to a bathtub and to one's own skin an electric field was created. By gliding one's fingers along the surface of the bathtub, Gray discovered, it became possible to turn it into »a musical bathtub.«

By exploring the implications of Gray's forgotten ideas and testing them in practice, DeMarinis came up with a series of astonishing artworks. Rubbing metal strings by one's hand (or a fruit) creates an electric circuit for manipulating and amplifying (pre-recorded) sounds. Having proven the correctness of Gray's forgotten theory, DeMarinis wondered what would have happened had he entered the patent office before Bell. Perhaps we would »enter the

washcloset to speak afar, stroking small tin tubs as we listen.«[5] Works like *Gray Matter* rewrite media history in the conditional, asking: »What would have happened if...?« However, such ideas are not just aesthetic reverie, or artistic fantasies projected into the past. If dreams and utopias are accepted as legitimate and »real« elements of culture, they also have broader historical validity, for they give form to desires that have guided and inspired the developments of media technology for hundreds and perhaps thousands of years. The desire to capture time, and to preserve sounds and voices that would otherwise have disappeared without a trace were factors that inspired the 19th century French poet-inventor Charles Cros to imagine his aptly named (never realized) sound recorder, »paléophone.« Yet he was also influenced by developments on the field of image reproduction. In the 19th century technologies of sound and image were often interconnected, also when it comes to cultural dreams and utopian prospects. The great French photographer Nadar conceived in 1856 the idea of an »acoustic daguerreotype,« which would »capture faithfully all the sounds transmitted in its objective.« Already in 1839, the year photography was introduced to the general public, the American Tom Hood had written in his *Comic Annual:* »In this century of inventions, when a self-acting drawing paper has been discovered for copying visible objects, who knows but that some future Niepce, or Daguerre, or Herschel, or Fox Talbot, may find out some sort of Boswellian writing paper to repeat whatever it hears.«[6]

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DeMarinis, »Gray Matter,« op. cit., p. 226.

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Ronald W. Clark, *Edison, the Man who Made the Future*, London: Macdonald and Jane's, 1977, p. 73–74.

Although DeMarinis often deals with sound, he is equally interested in other sensory registers, and their connections, both historical and contemporary. Sometimes the interplay between the audible and the visual provides the very core of the work, as in *Ich auch Berlin(er)* (1990) from the series *The Edison Effect*. In a way fulfilling Nadar's utopian vision about the »acoustic daguerre otype,« DeMarinis created an »acoustic hologram« of an old 78rpm record. When rotated on a turntable and scanned by a laser beam, the virtual image of the material record actually produces music; a feat some technologists considered impossible. In *Fireflies Alight on the Abacus of Al-Farabi*, a vibrating music wire, scanned by a laser beam and stretched across a darkened room, creates moving »fireflies,« virtual shapes based on persistence of vision.

In *Grind Snaxe Blind Apes — A Study for Pomeroy's Tomb* (1997), a funeral monument to the innovative San Francisco-based media artist Jim Pomeroy, who died accidentally at an early age, the emphasis is also on the visual. The central element is a mechanically moving »monkey's paw« that seems to be writing, line by line, on a rotating cylinder. What emerges is a series of phosphorescent faces (Pomeroy's), glowing for a while, and then disappearing. In the guise of a memorial to a deceased friend, DeMarinis also re-visits the early history of television, although the work also evokes Edison's early experiments of recording moving images on rotating cylinders. Typically, DeMarinis has presented his »proto-television« in a complex and eccentric setting, simultaneously evoking esoteric funeral rituals, ancient automata, 19th century freak shows and the world of electronically scanned images.

Unlike scientific and historical discourse, art is free to travel freely back and forth in time, connecting seemingly discrepant elements from different discourses and contexts. Art also has a license (or perhaps duty?) to avoid collapsing its elements into »conclusive« formulas. The potential meanings are left open without being channeled into »statements of purpose« or — worst of all — dogmas. *The Messenger* (1998–2006), one of DeMarinis's most ambitious works to date, and the winner of a Golden Nica in the internationally acknowledged Prix Ars Electronica competition, is such a work. It raises crucial issues underlying the role(s) of telematics in society, culture and politics, but avoids proposing any soothing resolution or simplified message. Rather, it activates new discourses by refusing to harmonize its elements or to fill in their cracks.

The Messenger presents us three unusual telegraphic receivers. A series of chamber-pots mounted sideways in a curved row can be heard every now and then to utter letters of the alphabet in Spanish, with barely audible voices.

The second system consists of a row of 26 glass jars, each containing an electrolyte and a pair of metal electrodes, one of them in the shape of a letter. From time to time one of the letters begins to produce a stream of hydrogen bubbles. The third and final system consists of 26 little skeletons hanging from a wooden scaffolding, each wearing a poncho with a letter. From time to time one of the skeletons jumps up, obviously triggered by some invisible force. This »force,« one discovers, is the Internet. As it turns out, the uncanny activities taking place in the installation space are a continuous reading of the e-mail messages entering the artist's inbox. The messages are read out, letter by letter, by each of the three telegraphic systems.

The Messenger delves deep into the formative stages of the wired world. DeMarinis found his inspiration from the forgotten projects and experiments by the Catalan scientist Don Francesc Salvá i Campillo (1751–1828). The newly discovered possibilities of electricity inspired Don Francesc to envision systems for communicating at a distance. Salvá made several different proposals for the telegraph.[7] He already intuited the possibility of using an underwater telegraphic cable to connect Spain to its American colonies, anticipating the first sea cable from 1858 by half a century. In 1804, he is said to have utilized electrolytic decomposition of water to transmit messages. As in DeMarinis' interpretation, the »interface« consisted of metallic letters immersed in glass jars to produce hydrogen bubbles. The most »shocking« of Salvá's projects was the idea of connecting 26 people to as many electric wires, each corresponding to a letter of the alphabet. A Leyden jar was used to send sparks across the wires, and each »wired« person had to shout out his/her letter after feeling an electric shock. A 27th person wrote the message down. DeMarinis interpreted this idea by using chamber-pot receivers inspired by Elisha Gray's ideas.

7
Paul DeMarinis, »The Messenger,« reprinted in this volume, p. 237–240; here: p. 238.

As DeMarinis interpreted them, Salvá's proposals were connected with the social and political space within which they were conceived. Salvá was anything but a spokesperson for »democratization of media« or »two-way communication.« His schemes were one-directional, reflecting the hierarchical power-structures of authoritarian colonial empires. The idea of using electrically shocked humans as telegraph terminals could be interpreted as the ultimate manifestation of a society based on slavery. Reduced to enouncing a single letter over and over again, the human was denied the right to meanings. This scheme also evokes the 19th-century ideology of industrial mechanization. The unskilled worker was reduced into a machine part forced to perform repetitive actions by the factory assembly line. As Ellen Lupton has shown, this situation was also extended to office work and telecommunications. Female telephone operators were literally chained to the switchboard for hours on end.[8] Like Salvá's human telegraphs, these women were excluded from the meanings their actions transmitted.

DeMarinis's installation evokes an »imaginary colonial telegraph reception hall« where »messages are received from inaccessible capitals, commands that have lost their meanings.«[9] Messages are pushed into the space, but they are never answered — a feedback channel does not even exist. The situation metaphorically links the imaginary colonial telegraph office with the communication strategies of totalitarian regimes, such as the Stalinist Soviet Union. This association is hardly a coincidence, for DeMarinis has also investigated the nature of the soundscapes of totalitarianism in works such *The Lecture of Comrade Stalin* (1998) and *Firebirds* (2004), where dictators' voices mysteriously emerge from gas flames like apparitions from the biblical burning bush. To counterbalance the stripped-down nature of totalitarian declamation, DeMarinis utilizes the noise of the communication channel itself (in the cybernetic sense) to compete for bandwidth and to add »grain« to the voice of the dictator.

8
Ellen Lupton, *Mechanical Brides. Women and Machines from Home to Office*, Cooper-Hewitt National Museum of Design / Smithsonian Institution and Princeton Architectural Press, 1993.

9
DeMarinis, »The Messenger,« op.cit., p. 239.

In *The Messenger* the noise is produced by the system itself because of its deliberate inefficiency. It may also have something to do with resistance to »the power of the center.« The messages that are gradually spelled out by the telegraphic receivers attain an ephemeral and absurd quality. The meaning-

lessness is metaphorically manifested in the »dance of the death« of the little skeletons, in the bubbles in the jars, and in the undecipherable utterances emitted by the chamber-pot-loudspeakers. Unless observed and written down letter by letter — who would have the patience or motivation to do so? — they will disappear forever. As the messages fade into obscurity, it is the anomalous (dis)communication channel, the telegraphic medium itself, that is highlighted.

In a retrospective-hypothetical form, *The Messenger* evokes an era when proposed technical solutions and social, political and cultural needs to communicate at a distance were still looking for a meaningful union. Although signaling systems had been used since antiquity, the need for establishing permanent communication networks was not yet generally acknowledged in the 17th and 18th centuries.[10] The proposals made by scientists and writers often concerned intimate interpersonal communication between lovers, rather than the exchanging of official orders and minutiae, not to say anything about dispatching financial and commercial data. For Father Strada, writing in 1616, the synchronized movements of two magnetic needles provided a possibility for telepathic communication »for lovers separated by the discipline of their families.«

Even Robert Hooke, the famous English astronomer, was thinking about private communication when he characterized in 1684 his experiments with signaling semaphors as a way of »making one's thoughts known at a long distance.« Hooke's other invention, the wire telephone that is still played with by children (two tin cans connected by a string), came to be known as »the telephone of the lovers.«[11] In 1802, Jean Alexandre, a reputed natural son of Jean-Jacques Rousseau, became known for a device known as the *télégraphe intime*, the intimate telegraph.[12] Telecommunication was seen as secretive, ephemeral and emotional, rather than as official, permanent and regulated. Whether this reflected just the fashion for »gallant« literary metaphors or for real cultural desires, it also shows that the official need for telegraphy was not a given.

Claude Chappé's optical telegraph that began operating in France in the 1790s during the revolution served the interests of the state and the military. It used lines of observation towers; each had an adjustable semaphore on the top and a telescope pointed toward the next tower. The messages were composed and interpreted by means of a codebook. The optical telegraph had both practical and symbolic meanings. It facilitated the official communication between Paris and the periphery, including newly occupied territories and battlefields. Thus it effectively served the interests of homogenization and centralization, an effect Napoleon understood very well. Although messages could be sent in two directions along the line, all lines had their starting point in a single location — Paris. Symbolically the optical telegraph created a space Patrice Flichy has called »espace national.«[13] The large territorial state was unified by the star-line net of the telegraph lines, shrinking it into more manageable dimensions, like those reigning in small city states like Geneva. The early history of the optical telegraph was characterized by a tension between democratic demands and autocratic and centralized uses. Individual citizens could only access its symbolic manifestations; citizens were able to observe the semaphores in operation, but not to decipher the contents of their movements. For them, the medium was the message, associating the government with new technology and assuring them that things were taken care of. The development of telecommunications became a long struggle for access between governmental, military, commercial and private interests.[14] The electric telegraph, the telephone and the wireless all inspired demands for wider access, sparking off intense debates.[15] Against this background, the current battles about the right to use and to control the Internet are nothing new. The right to personal and unrestricted access to the tools of communication has never been a given.

The Messenger reflects the debates on privacy and surveillance on the Internet. While the right to the privacy of telecommunications has never been a

10
About the early history of communication networks, see Armand Mattelart, *The Invention of Communication* (Minneapolis & London: University of Minnesota Press, 1996).

11
The examples above come from Patrice Flichy's *Une histoire de la communication moderne. Espace public et view privée*, Paris: La Découverte, 1991, pp. 16–17.

12
The device was probably electric. See J. Munro, »Heroes of the Telegraph,« Ch. 1: The Origins of the Telegraph, online at *http://www.worldwideschool.org/library/books/tech/engineering/HeroesoftheTelegraph/chap1.html* (last checked march 8, 2010).

13
Flichy, op.cit., p. 22.

14
See Flichy, op.cit.

15
See Carolyn Marvin, *When Old Technologies Were New. Thinking About Electric Communication in the Late Nineteenth Century*, New York: Oxford University Press, 1988.

given, its validity has never been more seriously jeopardized than in the post 9–11 world. Governments, businesses, criminals and terrorists are all looking for ways to intercept private communications. While there are those who are trying to achieve this through legislation, in the name of public security, others prefer to work in total secrecy, like the Bush government in the United States. The sense of being observed is becoming a widely shared state of mind. The world of telecommunications is in danger of turning into an all-embracing Panopticon: you cannot escape the feeling that anything you do with your computer or your cell phone may, or may not, be monitored and recorded by someone else at any moment. Simultaneously the massive tidal waves of SPAM that fill your inbox lead to a growing feeling of unreality. This stream of data no longer arrives from »inaccessible capitals«, but from unknown peripheric locations, routed via untraceable paths. Searching for a few personal messages from a sea of anonymous unsolicited and often undecipherable e-mail may evoke a sense of an absurd void-in-excess reminiscent of the ghostly transmissions of DeMarinis' telegraphs.

A growing number of artworks have utilized, scrutinized, measured and criticized communication networks, particularly the Internet. This is not just a sign of the artists' interest in extending their repertories, or of the artworld's willingness to redefine its territory. It is also, and perhaps primarily, a reaction to the mounting pressures against individual expression and the freedom of action on the Internet (in this sense, hackers and artists share some goals). As a consequence, many Internet-related artworks have a strong »meta-medium« quality, using the medium to deal with the medium. This is evident in works from »browser art« like Mark Napier's *Riot* and *Feed* to mappings and transformations of the Internet's data traffic such as the *Carnivore* by the Radical Software Group (RSG). By focusing on the iconography of the interface and the hypertextual structuring of the World Wide Web, browser art recycles and transforms features that are already part of the medium. Creating collages from the material available on the Net by means of a code written for the purpose may highlight certain aspects of the Internet, but its critical potential is limited. Such art has recently been characterized as an inheritor to the traditional art of painting — »Web as a Canvas« — shifting the attention from the critical questioning of the Internet to the tracing of continuities with existing artforms.[16]

Carnivore got further by replicating secret tools used by the authorities to monitor and record Internet use, making them available as freeware and redefining them as tools for creativity.[17] Such projects stated that Internet-related art cannot be content with creating or recycling »surface events.« It has to tackle the infrastructure itself, or the codes and protocols that condition the textual and graphic manifestations innocently called up on the screen by non-technical users.[18] The emergence of »software art« that emphasizes the primacy of codes and coding in the digital art practice is a reply to such challenges, although not all the forms of software art are openly political in their goals; some of them emphasize a new critical formalism, celebrating the beauty of the code for its own sake.[19] The appearance of software art and other artforms representing the »meta-medium« approach is certainly welcome, although it is not without risks. Declaring the code and the coding principles as the main criteria for an artwork at the expense of other features may limit the potential audience to the small circles of cognoscenti. In the worst case it may also lead to a new dogmatism. All this may distract the attention from the goal of using art as a means of maintaining a critical dialogue and intervening with networked media, conceived not just as technical, but also as social, economic and cultural spaces.

In his well-known *The Victorian Internet* Tom Standage argued that many of the features and discourses associated with the Internet and considered as absolute novelties were already anticipated by the cultural formations developed around earlier telecommunication systems such as the electric telegraph.[20] Support for this argument can be easily found from works by cultural historians of technology such as Susan J. Douglas and Carolyn Mar-

16
»Web as Canvas/La red como lienzo«, in *Art Futura* 2002, catalogue, ed. Montxo Algora and José Luis de Vicente, Madrid: Ediciones Anaya Multimedia, 2002.

17
www.rhizome.org/carnivore/

18
These thoughts have been influenced by my discussions with art historian Gloria Sutton.

19
See my »WEB STALKER SEEK AARON: Reflections on Digital Arts, Codes and Coders«, in *Code – The Language of our Time.* Ars Electronica 2003, ed. Gerfried Stocker and Christiane Schöpf, Ostfildern-Ruit: Hatje-Cantz Verlag, 2003, p. 110–128.

20
[illegible] Standage, *The Victorian Internet*, New York: [illegible] Company, 1998.

vin.[21] Such a historical awareness is lacking from many Internet-related artworks. No matter how critical the approach, the Internet is treated as an absolute novelty. Underlying such works, there is a hypothesis about a paradigmatic rupture separating the Internet from its predecessors. Culturally and theoretically informed artworks delving into the pre-history of today's telematic culture and pondering its continuous relevance for understanding media culture in the era of the Internet have been exceptions.[22]

The Messenger is one of these rare works. One of its achievements is its complete lack of didacticism and theoretical-political finger pointing. Its media-archaeological discourse never turns into declamation, which increases, rather than diminishes, the power of its uncanny poetics. The artist's private communication is presented for us to decode (like in a global peep show), but who would ever take the pains to write down what is dictated from afar, letter by letter? The basis of the work is deliberately absurd, with messages continuously appearing, and disappearing into nothingness. As many of DeMarinis's earlier works, it reveals us the other side of communication: pauses, silence, noise, ambiguity, misunderstanding and eventually — death.

21 Susan J. Douglas, *Inventing American Broadcasting 1899–1922*, Baltimore and London: The Johns Hopkins University Press, 1987; Carolyn Marvin, op.cit.

22 *Winke Winke*, a hybrid of the optical telegraph and computerized communication by Gerfried Stocker, Anton Fuchs, Anton Maierhofer, Wolfgang Reinisch and Jutta Schmiederer (Austria, 1993) is one of the few works that come to mind. See *http://www.kunstradio.at/ZEITGLEICH/INSTALLATIONS/WINKE/index.html* (last checked March 8, 2010).

Thinkering with Media
Zur Kunst von Paul DeMarinis

Erkki Huhtamo

Fragments of Jericho (1991), eine der dreizehn maschinischen »Skulpturen« in Paul DeMarinis' Installation *The Edison Effect*, verlangt vom Betrachter, Geschichte in ihrer akustischen Dimension nachzuvollziehen.[1] Auf einem alten Plattenteller rotiert ein gesprungenes, angeblich einer untergegangenen Zivilisation entstammendes Tongefäß. Tastet der Ausstellungsbesucher seine Oberfläche mit einem Laserstrahl ab, bekommt er in seinen Rillen gespeicherte kaum hörbare krächzende Klänge zu hören (Pygmäengesänge, soweit ich mich erinnere, die der Künstler mit einer geheimen Methode dort platziert hat). Was, so fragt die Arbeit, wenn die Geräusche früherer Zivilisationen durch irgendeinen Zufall in verzierten Tongefäßen (oder Keramikplatten oder Geweben) erhalten geblieben wären?[2] Was, wenn die Stille der Vergangenheit nur auf unsere Unfähigkeit zurückzuführen wäre, ihre Klänge wiederzugeben? Selbstverständlich gibt es auch andere Referenzen. Das Tongefäß erinnert an die Zylinder, die bei Edisons Phonographen (1877) zur Aufnahme, Speicherung und Wiedergabe verwendet wurden. Es ist die Begegnung eines Laserstrahls (der immateriellen »Nadel« von CD-Playern) mit einer Phonographenwalze auf einem Schallplattenteller — das Ganze verrührt zu einer paratemporalen Suppe, in der sich Gegenwart, Wirklichkeit und Fantasie mischen.

In einer langen, eindrucksvollen Liste von Arbeiten hat DeMarinis die Vergangenheit in Form alternativer Realitäten neu erschaffen und damit herrschende Sichtweisen der »realen« Geschichte der Audiotechnologie infrage gestellt. In einem seiner Essays kritisiert er die der Technologie zugewiesene Rolle: »Nach einem weit verbreiteten Glauben ist die Technologie die Trieb-

1 Dieser Essay beruht auf zwei früheren Texten: »Excavating Sounds: On the Art of Paul DeMarinis« in: *Excavated Sounds. The Media Art of Paul DeMarinis*, ed. Päivi Talasmaa, Espoo: Otso Gallery, 2000, S. 10–15, und »An Archaeology of Networked Art: A Symptomatic Reading of The Messenger by Paul DeMarinis«, in: *Networked Narrative Environments*, ed. Andrea Zapp, Manchester: Manchester Metropolitan University, 2004, S. 32–44.

2 Die letzteren zwei Möglichkeiten hat DeMarinis in *Dinner at Ernie's* (1995) und *Singer of Songs* (1996) erkundet.

eingehend mit der Vorgeschichte unserer heutigen telematischen Kultur beschäftigen und über deren anhaltende Bedeutung für das Verständnis der Medienkultur im Internetzeitalter reflektieren, sind eher die Ausnahme.[22] *The Messenger* ist eines dieser seltenen Werke. Eine seiner Stärken ist die vollständige Abwesenheit jeglicher Didaktik und aller theoretisch-politischen Schuldzuweisungen. Sein medienarchäologischer Diskurs verfällt nie in Deklamation, was der unheimlichen Poesie der Arbeit keinen Abbruch tut, sondern ihr eher noch zugute kommt. Die private Korrespondenz des Künstlers wird (wie in einer globalen Peepshow) vor uns ausgebreitet, aber wer würde schon die Mü-he auf sich nehmen, das aus der Ferne Diktierte Buchstabe für Buchstabe mitzuschreiben? Mit den ständig neu auftauchenden und sich in Nichts auflösenden Nachrichten ist die Arbeit bewusst absurd angelegt. Sie verweist wie viele von DeMarinis' früheren Arbeiten auf die Kehrseite der Kommunikation: Pausen, Stille, Lärm, Rauschen, Mehrdeutigkeit, Missverstehen und letztendlich — Tod.

22
Winke Winke, ein Hybrid aus optischem Telegrafen und Computerkommunikation von Gerfried Stocker, Anton Fuchs, Anton Maierhofer, Wolfgang Reinisch und Jutta Schmiederer (Österreich 1993) ist eine der wenigen Arbeiten, die einem hier einfallen. Siehe *http://www.kunstradio.at/ZEITGLEICH/INSTALLATIONS/WINKE/index.html* (zuletzt aufgerufen am 8. März 2010).

Some Artworks by Paul DeMarinis

Douglas Kahn

Paul DeMarinis' artworks have their origins in what would have been the arts and science of antiquity. This seems like a good place to start. Pythagoras used his monochord to demonstrate a correlation between mathematics and musical pitch. You could hear physical forces in the sound and see them in the division of the string. Given that it was a small audio-visual device, embodying the organizing principles of the cosmos was an added bonus. Similarly, some artworks by DeMarinis are philosophical instruments, demonstrate scientific principles, and make sounds and music.

Give or take a millennium along the historical line between Pythagoras and DeMarinis we find the 10th century musical researches of the Persian polymath Abdul Nasr *al-Farabi*. DeMarinis refers to him in his *Fireflies Alight on the Abacus of Al-Farabi* (1989), a long music wire, in one version sixty feet, a room-size monochord of sorts. Numerous loops of fishing line jump around the harmonic nodes of the vibrating wire; their erratic little dances fall in the spotlight of a laser beam running parallel to the wire in a darkened room, reminiscent of hot summer nights of fluttering wings of fireflies caught in their own light.

Some artworks are reminiscent of the beautifully crafted scientific instruments that informed, edified and entertained those gathered in the halls and parlors of the 18th century, demonstrating the natural phenomena that had yet to disappear into mathematical thinking, and philosophize through things and forces that had yet to disappear into language. Communications and media technologies that grew out of the 19th century were, likewise, variable technologies, simultaneously acting as aesthetic devices for observing nature, as scientific instruments and philosophical tools. Telephones were not just for talking; you could hear the footsteps of flies and the sounds of the sun in a device that promised to shrink the known personal and geopolitical world, if not the cosmos. We have forgotten these multiple engagements now that we are saturated with multiple communications devices, each new generation dying younger. The multiple variable relationships with the world have been collapsed and reduced into what we now call technology.

»Technology« has rolled over into a world unto itself in a grand cycle of autogenesis. DeMarinis reverse engineers this closed cosmos by opening it to all the mundane, historical, political, phenomenal, physical worlds »technology« actually inhabits. His true forte is to cycle and recycle these worlds through one another, by inventing inventions that fold past inventions in through contemporary technology. Among the works that make up the masterful *The Edison Effect* (1989–1996) there is a phonograph needle made from a laser, and a hologram of a vinyl record played by a needle made from a laser. We already know that recording is a phantom; DeMarinis presents three simultaneous materializations of this phantom. The vinyl record is the most ancient: it still has a connection with the material world, that is, vinyl, which must be mineral. The second phantom is anchored by the dead weight of holography, which promised to be the photography of virtual reality but ended up as a paperweight. And the third, the laser, has been wildly successful and ubiquitous but, then again, it is coordinated light. All this before we know what was recorded: so we are already listening through different historical positions.

You get the feeling that had DeMarinis been born just a few years earlier consumer culture would have been very different. Compact discs would have been unnecessary; only the player would have been replaced. LPs would have

stood up to pressures for technological turnover; laptops would have grown up around LPs and would be a little larger than album covers. Without CDs, those shrunken double agents of data, capitulation to the internet would have been staged against vinyl in a sublimely violent rupture. We would be mourning other objects in the dustbin of history.

Making a holographic record of a record is a form of reverence for a beloved object that has fallen into obsolescence, a funereal glazing for the gazing, a monument of suspended animation much like Lenin in his tomb; Snow White, he was called, without a kiss for playback. Man Ray's *Dust Breeding* (1920), a photograph of one year's dust built up on Duchamp's *The Large Glass*, recuperated photography into landscape painting, and art into aerial photography, but bury it under six-feet of dirt and it would not compare to the layer of dust built up on record collections around the world as they were lowered into history, even as they tried to scratch their way back into life. The story has been repeated with millions of CDs in their jewel cases succumbing to online downloads, or becoming elevated into floor tiles for a Christian Marclay artwork (*Echo and Narcissus*, 1992). This is a familiar process in what has become an anticipated generational acceleration of technological turnover, driven to maximize profits, to be sure, but it relies on the specter of our own mortality, or at least a closer mortality mediated by our pets.

DeMarinis has suspended these recordings in the optical formaldehyde that is holography. It is very much like Portnoy's mother who could make »sliced peaches miraculously defy the laws of gravity« with Jell-O: uncanny. He takes the scattered facets of a diamond stylus and trains them into the well-trained light of a laser, and then focuses it onto inscriptions submerged in the midst of the glass. The intense focus erases the object of recording with light, allowing the performance to become more transparent. The record of the record becomes more original than the original, but all that is really heard is the ephemeral nature of technology spiraling towards its own demise, making sound while spinning in its grave. Because all good thinks must come to an end, what we hear spilling from one glass record is another round of the Beer Barrel Polka, as though Emil Berliner went home for Oktoberfest.

Herein lies history recorded in the everyday, and this is where DeMarinis differs from the hermetic stylings found in the objects, even the found objects of that other glass artist. Duchamp inscribed the concept of *crashes and splashes* onto the surface of *The Large Glass*, but we do not hear the serendipitous sound of chance that the *Glass* made in its crate when it fell or was dropped in handling. We have heard other hidden noises from Duchamp (*A bruit secret*) and we can hear this glass crack in our heads right now, but perhaps there is a retinal laser that could playback cracked media in reverse. Whereas both artists build things, DeMarinis invents things so that we can hear.

Reenacting invention through invention creates convolutes of signs of images of signals in recordings of inscriptions that can be fed back upon one another and vice versa. It is as though DeMarinis has taken one of his holographic records, heated it up and formed it into a Klein bottle of discourse. A Klein bottle is an unbounded surface. Time travel any direction on the surface not only do you never fall off the object, you wind up being wound up in an eternal return, in tune with Nietzsche's music box. What we hear is the march of technology into the future getting worn in the groove, losing teeth, winding down under the weight of accumulated history and folded under a more fundamental composition.

What has enabled DeMarinis to build history into his objects as a design element, no matter their materials, is an unbounded receptiveness to all the ambiences they inhabit. In his earlier works, this openness was technological; subsequently, his artworks became receptive to political and historical forces. The five-note phrases of the small music-making circuits of *Pygmy Gamelan* (1973) were induced by induction, ambient electromagnetic fields responding to people's bodies moving nearby, and imperceptibly perturbed by transmissions from the cosmos. The Cosmic Microwave Background, the echo of the Big Bang, can be seen amid the static of broadcast television; is it surprising

that *Pygmy Gamelan* conducted its improvisations in part from the birth of distant stars? These are not interferences from noise sources, but openness to the influence of weak forces.

Some of DeMarinis' artworks are inventions open to phenomena, say, rain that makes music atop an umbrella — a singing in the rain, just singing in the rain, where the rain does the singing. *RainDance* (1998) is a bona fide crowd pleaser, not merely public. Audiences queue to walk through simple musical tunes played by precisely timed little jets of water: 440 drops per second plays A; 260 drops per second plays middle C. The umbrella forgets its dreams of being a parachute in disguise and reveals itself instead as an actual loudspeaker. Or perhaps the umbrella is some type of antenna. Weather reports may soon come with a play list. We should have been more sensitive to its variable technological tendencies, since it has always been a piece of finely pitched percussion, a big prosthetic eardrum that keeps us dry. Then there is the dance that people do in this musical rain: walking, stopping, spiking the sky and tilting their heads to listen, walk again. When they move the umbrella toward the rain the pitch of the tune increases, pull it away and it decreases. In the artistic science of meteorological acoustics this is called »the Droppler effect.«

A similar device could be designed into fancy showerheads but umbrellas conflict with cleanliness. *RainDance* would actually work well in water parks to tide people over while they wait in line. There are no doubt other lucrative applications and DeMarinis must surely be one slippery step from excessive wealth. We know how genius and consumption breed to create wealth from the pulp romances of Great Inventors, and in the adventures of patent disputes and business models. In the meantime, those who have made their way through *RainDance* have been primed to perform Romantic repertoire spiking their umbrellas into the sky during the next thunderstorm, and to find their ambient instruments for a thick fog.

Even the genesis of his crowd-pleasing pieces is housed in a historical context. In 1982, DeMarinis created his popular *Music Room* giving innumerable wannabe air guitarists their first feel for hands-on experience. It was installed at the Exploratorium, the great San Francisco institution that has commissioned innumerable artists to create demonstrations of science and technology. The founder of the Exploratorium, and the person who had hammered the role of artists within it, was Frank Oppenheimer, the physicist who had worked in the Manhattan Project with his famous brother. The Exploratorium has instituted art and science in opposition to that unsung military art historical masterpiece, *The Great Artiste*, the bomber that dropped scientific equipment on Hiroshima and Nagasaki.

In fact, history is closer to home. An early venture into history, *An Unsettling Matter* (1991) was an installation first exhibited at Ars Electronica. It was uncharacteristically autobiographical, only because his boyhood intersected with a profound historical moment in politics and technology. Born under the sign of *gamma*, DeMarinis grew up in Cleveland in a scientific family. In 1957, his father followed his work and took the family westward

> ...to Ely, Nevada about 100 miles downwind from the atomic test site. My father, a geneticist, had taken a job with the United States Public Health Service monitoring the pathways of radioactive fallout through the sparse ecology of the desert. Sometimes we would wake in the early hours of the morning to see a bomb go off. We'd listen to the countdown on dad's radio, watch as the sky lit up in premature desert sunrise, only to disappear into night and stars again. In the days following a test I remember seeing spectacular sunsets, red walls of fire in the evening.[1]

DeMarinis accompanied his father on trips to gather filters and dosimeters used to measure exposure of people and places to atomic testing scattering radioactive materials to the wind like sagebrush, tumbling over the vitrified sands of lonesome Western landscapes. He realized that, just like the measurement missions of *The Great Artiste*, »The Atomic Energy Commission was probably more interested in analyzing the isotope-ratios to ascertain the

1
Paul DeMarinis, statement on *An Unsettling Matter*, Ars Electronica, Linz, Austria, September 1991, also in this volume, p. 122.

efficiency of the bomb, than in protecting the citizenry from their excesses.«
During October of 1957, after the family returned to Cleveland, Sputnik was traversing the sky, moving at a speed between a scientific mission and the politics of the Cold War while transmitting the most important *beep* in history. The beeping stretched over the horizon in a Doppler, a global electronic music in the latter-half of the 1950s heard alongside kid-culture blaring from cheap AM radios. This was a time that the television screen was the only thing standing between a frighteningly entertained audience and a space-age gamma ray gun shooting from the back of the box. Everything was radiant and rastered. Happy families had their summertime meals on Fiestaware plates while being irradiated by the red-orange glazes of uranium oxide. What DeMarinis wrote of his friend and collaborator Jim Pomeroy is applicable to himself: »[…] a certain breed of American artist who grew up in the military-industrial culture of the Sputnik era: artists who had been inculcated with the codes of science and technology, but who had reterritorialized them to identify technology with culture, and electronics with communication. […] artist-tinkerers who bypassed or defied the intended uses of technology, who disrupted the hierarchy of the messaging apparatus.«[2]

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Paul DeMarinis, »The Boy Mechanic — Mechanical Personae in the works of Jim Pomeroy«, in: Timothy Druckrey & Nadine Lemmon, eds., *For a Burning World is Come to Dance Inane: Essays by and about Jim Pomeroy*, New York: Critical Press 1993. Available online at *http://www.jim-pomeroy.org/demarinis.html*

In a work from the *Edison Effect*, *Loving/Dying – The Unrequited Quark*, a laser plays an old recording of Richard Wagner's *Liebestod* from »Tristan and Isolde,« open to the radiations of local influences. Actually, it is played by both a laser and a Geiger counter: two readers of contemporary texts and contexts. Like other pieces in *Edison Effect*, *Loving/Dying* is a beautifully crafted instrument, of sorts, as though a precision lathe were on display in an upscale shop.

> The stepping motor which advances the beam along the groove is controlled by the pulses from a Geiger counter. With background radiation the music progresses very slowly, resulting in sustained Wagnerian chords. As a piece of radioactive material (the only real source of time) is uncovered, the music achieves its normal rate of progression, resulting in a recognizable version of the *Liebestod*.

You may perhaps recognize this tune from *Un Chien Andalou*, the Surrealist film famous for making the *Liebestod* listenable. There is an especially poignant and lascivious scene in the film where the theme of unrequited love takes on a musical note as the male protagonist strains toward the female object of his desire, dragging two grand pianos, two priests and two dead donkeys on ropes toward her. This is unrequited love in its compressed form, weighted down by an accumulation of symbols. Luis Buñuel, one of the creators of the film, stated late in life that his great regret about growing deaf with age was that he would have no music to usher him into death. Music would be a good torch song for an old man after a loving/living erotically marked off by *les petites morts*. DeMarinis' *Loving/Dying* relocates the music of such Romantic entanglements onto the half-lives of uranium decay. The time of aging and of the ages is erratically marked off with the clicks of a Geiger counter not a mechanical tick of a clock, taking so long to decay into death that any love left will be in the afterlife, just like the story says. The unsettling source of radiation in one version of *Loving/Dying* is a plate of red-orange Fiestaware. This does not therefore make the *Liebestod* any easier to stomach.

The capacity for DeMarinis' artworks to receive and store historical signals becomes literal in *Rome to Tripoli* (2006), based on a spark-gap radio transmitter from the first decade of the 20th century that used the modulation of a stream of acid both for its technological function and the cultural politics it messaged.

> A stream of sulfuric acid, mechanically vibrated by the voice, reproduces the interruptions of the vocal frequencies as a series of droplets. This stream is passed between two electrodes biased at a DC voltage. Each drop directs a short burst of electricity to a high-voltage transformer configured as a spark-gap radio transmitter. The signals are broadband and can be picked up by any AM receiver in the vicinity. The piece poses ques-

tions about the nature of one-way communications, radio-phonic, cultural or military, in particular those between Europe and North Africa.[3] Moreover, it was used to transmit long distance messages from *Rome to Tripoli* as a prelude to the Italian invasion of Libya. This is a device associated with Quirino Majorana, an Italian physicist that those of us in media history will now know thanks to the research of DeMarinis. This is one of the careful digs for which DeMarinis is known. It differs in two ways from most media archaeology in that he reconstructs while he deconstructs, i.e., he builds not just understands, while the rest of us write. In fact, the construction involved the jets of drips found in *RainDance*. Secondly, he unearths politics from the detritus in the bin of history, while media archaeology rarely gets its hands dirty with anything besides pithy surrogates.

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Paul DeMarinis, artist program notes to *Rome to Tripoli* (2006), reprinted in this volume, p. 183.

The history of communication technologies, in their ability to annihilate space and time, is an expansive one, that is, in the best sense imperialism could self-create, especially as resource and labor extraction contracted in a return circuit to the sender. The British Empire, for example, telegraphed its intentions. Wireless telegraphy demonstrated its heroic athleticism with Marconi's one letter »S« disappearing over the horizon of the Atlantic, and although he was operating from England, an Italian nation's thoughts would turn to exploits across intervening bodies of water. DeMarinis hears Majorana's invention as an intervention projecting Italian conquest nearly 1000 km across the Mediterranean. He hears it in a play list of Roman roaming that includes, among others, Verdi's earlier anthem to North African invasion and a recording of F. T. Marinetti's own recitation of *Battle of Adrianopoli*, embodying the expansionist military energies of the avant-garde (a military term) in Italy, in the Futurist codification of noise in the Art of Noises and early transmission of the »wireless imagination.«

A high modernist precedent for *Rome to Tripoli* can be found in a passage in *Finnegans Wake* where James Joyce takes out his verbal toolkit for a little bit of his own radio engineering. Instead of a signal crossing the Mediterranean from Italy, Joyce constructed a punning version of an antenna used to locate signals for navigating called the Bellini-Tosi direction-finding antenna from the Marconi Wireless Telegraph Company, transforming it with the one letter »t«: »supershielded umbrella antennas for distance getting and connected by the magnetic links of a Bellini–Tosti coupling system.« He thereby replaced the original inventors of the antenna with two Italian composers of *bel canto* and saccharine songs, Vincenzo Bellini and Francesco Paolo Tosti, the latter, like Marconi himself, made his way and his fortune after finding his way from *Italy to England*. Joyce's wireless sings the sweet songs of British Rule across the Irish Sea from *England to Ireland*. Add the Francophone transit from *France to Algeria* of Frantz Fanon tuning into Radio-Alger in *A Dying Colonialism* and what we find is that the power of the signal among circuits and circulations of minstrels and migrations depends on who is sending and who is receiving.

In some artworks DeMarinis collapses histories into invented devices like Joyce collapses them into invented words; he builds while others write. He is a rare breed of artist in command of politics, poetics, soldering and programming. But these are just some artworks.

Einige Kunstwerke von Paul DeMarinis

Douglas Kahn

Paul DeMarinis' Kunstwerke haben ihren Ursprung in der Kunst und Wissenschaft der Antike. Dies scheint jedenfalls ein guter Ausgangspunkt zu sein. Pythagoras demonstrierte mit seinem Monochord eine Verbindung

te nicht nur das rationalistische Denken der Aufklärung, sondern auch das schon erwähnte Aufkommen irrationaler Vorstellungen. »Elektrizität« und »Magnetismus« wurden zu Metaphern für geheimnisvolle Lebenskräfte, was sich im Hören von Geisterstimmen, in seltsamen Theorien der Medizin (elektrische Bäder) bis zum gesteigerten Interesse an Hypnose äußerte, ein geistiges Erbe, das bis heute in Europa und Amerika gleichermaßen wirkt.

In diesem historischen Raum, aus dem unsere moderne Zivilisation gewachsen ist, schaut sich Paul DeMarinis um. Und was sieht er? Mediale Techniken sind nicht das Ergebnis einer plötzlichen Erfindung, sondern vereinigen verschiedene Entwicklungsstränge mit unterschiedlicher historischer Tiefe. Es gibt kein lineares Wachstum des Wissens. Am Rand der verschlungenen Pfade der Technik- und Ideengeschichte liegen viele aufgegebene oder vergessene Projekte, vollendete oder unfertige Apparate und Konzepte. Form und Funktion scheinen dabei — jedenfalls von heute aus gesehen — selten logisch aufeinander bezogen. Wie konnte Soemmering z.B. die Elektrolyse mit menschlicher Kommunikation in Verbindung bringen? Es macht erst dann Sinn, wenn man zur Kenntnis nimmt, dass Soemmering sich mit dem Gehirn und dem Selbstbewusstsein befasste (seine Klassifikation der Gehirnnerven ist bis heute gültig). Für ihn hatten die Flüssigkeitskammern des Gehirns eine integrierende Funktion für Nervensignale. Seine Schrift über den Sitz der Seele (zu der Kant einen Kommentar schrieb) wurde so intensiv diskutiert wie heute allgemeinpopuläre Schriften aus der Hirnforschung.[8] Als dann das Prinzip der Hydrolyse entdeckt worden war, kombinierte er diese mit seiner Theorie der Nervenleitung.

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Samuel Thomas von Soemmering, *Über das Organ der Seele* (1796), Reprint Amsterdam 1966; siehe auch: Peter Mc Laughlin, »Soemmering und Kant: Über das Organ der Seele und den Streit der Fakultäten«, in: *Soemmering Forschungen* 1 (1985), S. 191–201.

Paul DeMarinis nennt die Apparate und Konzepte, auf die er bei seinen archäologischen Forschungen stößt, »Chimären«. Der Ausdruck für die uns eigenartig erscheinenden Mischwesen im Arsenal der verschwundenen und vergessenen Dinge erinnert an Bruno Latours Begriff der »Quasi-Objekte« für Dinge, die zwischen Natur und Kultur entstehen und neue gesellschaftliche Praktiken hervorbringen. »Das soziale Band der Gesellschaft«, sagt Latour, »besteht aus Objekten, die im Laboratorium fabriziert sind«[9]. Das Besondere an den Objekten der Elektrizität des 18. und frühen 19. Jahrhunderts ist, dass sie noch in einem Wechselspiel von Erfahrung und sinnlicher Wahrnehmung erzeugt wurden, ein Prozess, welcher der künstlerischen Praxis ähnlich ist. Vermutlich liegt hier auch der Grund für die besondere Attraktivität dieser hybriden Dinge für einen Künstler wie DeMarinis.

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Bruno Latour, *Wir sind nie modern gewesen*, Frankfurt a. M.: Suhrkamp 1998.

Die Integration von solchen technischen Artefakten in die Kunst ist von der Seite des Betrachters mit Problemen verbunden. Denn technische Apparate sind für eine ästhetische Wahrnehmung nicht ohne weiteres anschlussfähig. Uns ist eine strikte Trennung der Selbstwahrnehmung von der scheinbaren Objektivität der Technik antrainiert. In den Naturwissenschaften ist dieses Ausblenden der Subjektivität die Vorbedingung der objektiven Erkenntnis. Dieses Prinzip ist in die Alltagswahrnehmung eingedrungen und verhindert, dass wir technische Dinge als Sinnbilder für Phänomene oder als Teile eines Netzwerkes sehen. Anders gesagt: Wir interessieren uns mehr dafür, was man mit ihnen machen kann (oder soll) als dafür, was sie mit uns machen. Diese Aura der Objektivität, verbunden mit dem Werkzeugcharakter der technischen Dinge, führt dazu, dass wir uns mehr an den klassischen Kunstmaterialien Klang und Bild orientieren und eher nach den durch die Apparate vermittelten Botschaften suchen.

Und natürlich spielen Klang und Bild bei DeMarinis Arbeiten eine große Rolle. Sie sind wichtige Bedeutungsträger (auch die technischen Aggregate sind ja »Bilder«). Außerdem zeigen sie, dass seine Apparaturen funktionieren. Das Entscheidende ist jedoch, dass sie ein Denken zeigen, das dem der so genannten modernen Technik diametral entgegengesetzt ist. Deren Denken — institutionalisiert und anonymisiert in Großstrukturen — ist gekennzeichnet durch Beschleunigung und Verlust der Sichtbarkeit. Außerdem verhindert ihre ständig erneuerte Präsenz die Wahrnehmung ihrer Geschichte. DeMarinis Arbeit öffnet Ausblicke auf verborgene oder verdrängte Räume, die auch unsere Gegenwart mitbestimmen. Seine Technologien sind angepasst

an die Langsamkeit der menschlichen Wahrnehmung und transparent für ihre eigene Vergangenheit. Seine Arbeit bezieht ihre Faszination aus einem großen Reservoir technischer Praxis, aus einer Zeit, in der diese Praxis der Theorie noch voraus lief, bevor sie sich der scheinbaren Zwangsläufigkeit moderner Theorieentwicklung unterordnete. In DeMarinis Arbeiten beginnt die Vergangenheit, sich zu verändern (um mit Latour zu sprechen). Man kann den Eindruck gewinnen, dass die »Quasi-Objekte« nur darauf warten, dass jemand mit ihnen Anschlussmöglichkeiten in neuen Handlungsräumen erprobt oder sie wenigstens als Teil unserer Bewusstseinsgeschichte entdeckt. Ein nicht nur technisch versierter Künstler wie Paul DeMarinis zeigt uns auch, dass die Gestaltung der Technologie nicht an die »Experten« delegiert werden muss.

Another View of Technology

Bernd Schulz

Paul DeMarinis has an unusual way of using communications media. Technologies are not employed solely as a means for certain purposes; the materiality of the things themselves and their history are interrogated. DeMarinis thereby also asks »how material things worm their way into our personal relationships«.[1] This is a difficult procedure, because our perception of media technology is always already preshaped, and this generates blind spots or, as DeMarinis says, produces »new numbnesses« that we don't notice. DeMarinis' works force the viewer to pay attention to historical developments. He thereby confronts the fact that technological media are not only tied to the development of knowledge, but are also bound up with and create cultural practices. Art, too, can be regarded as a cultural practice, so the question arises whether this practice is also influenced by the history of technology. The following attempts to make out some geographical perspectives in the vast landscape of technological history.

Richard Feymann, a physicist who took part in the Los Alamos project to build the atomic bomb, remarked that it was easier to explain the existence of angels than of an electromagnetic wave.[2] In his memoirs, he vividly depicts how, as a boy of 11 or 12, at night in bed he listened to a crystal radio set and developed into an enthusiastic amateur radio builder.[3] The later Nobel prize-winner was no exception. As the radio researcher Wolfgang Hagen pointed out in a comparative study of the history of radio in Germany and the United States, radio developed as a mass medium earlier and more rapidly in the New World than in Europe. In 1924, when radio was still in its infancy in Germany, the United States already boasted 30,000 amateur broadcasters and 5,000 commercial radio stations and college stations at 22 universities.[4] Practically anyone could acquire a license. Among the amateurs was the young John Cage, who received a permit to produce a weekly broadcast for the Boy Scouts. By contrast, in Germany, licensing was always a military/sovereign act and the development of radio stood under state control — which was one of the reasons the Germans couldn't become a nation of ham radio operators before 1933, much less during the rule of the Nazis.

1 Paul DeMarinis in: Peter Kiefer (ed.), *Klangräume der Kunst*, Heidelberg: Kehrer 2010, p. 238.

2 Richard P. Feynman, *The Feynman Lectures on Physics* (1964), vol. 2, Reading, Mass.: Addison-Wesley 2007.

3 Richard P. Feynman, »*Surely you're joking, Mr. Feynman*«. *Adventures of a Curious Character*, New York: Norton 1985.

4 Wolfgang Hagen, *Das Radio. Zur Geschichte und Theorie des Hörfunks – Deutschland/USA*, Munich: Fink 2005.

The different names for the same phenomenon, »radio«, already reflect differing developments. The German name »Rundfunk« recalls the snapping spark with which electromagnetic waves were produced from Marconi to the Telefunken company, i.e., until the introduction of the tube transmitter, whereby its use to convey information was always conceived as a military/sovereign chain of command (a one-way, top-down communication). In the United States, in the beginning, radio was understood or misunderstood as a kind of wireless telephony, i.e., two-way communication (because few frequencies were available, the broadcasters were forced to coordinate their broadcast times by means of call and response). The spark transmitters were replaced at an early date with alternating current generators. These are not the only striking differences between the histories of technology in Europe and the United States. But the differences are concealed by the high degree of uniformity in the mass media.

Inventors were the heroes of 19th century American history, and the prototype to this day is Edison, on whose birthday »National Inventors Day« is celebrated. In 1871, while the Kaiser's German Empire was celebrating its victory over France, thousands streamed together in New York's Central Park to experience the unveiling of a monument to Samuel Morse on his eightieth birthday. In the evening at the Music Academy, people listened to the sound of Morse personally operating the telegraph key, also called the »sounding key«.

This reveals a consciousness that does not know the opposition between culture and technology that the European tradition gave rise to. In the United States, technology, and especially media technology, was always part of culture. The reasons for this are many and, considering the interconnections between European and American history, sometimes seem paradoxical. Recall that adherents of irrational ideas about electricity (telepathy, clairvoyance, necromancy, etc.) fled to America before the French Revolution. Among them were also devotees of mesmerism, which Benjamin Franklin, as a member of a royal evaluation commission, had combated as unscientific some years before. One hundred years later, scientifically and technically well-educated Socialists had to flee Germany. Among them was Charles Proteus Steinmetz, who wrote a book titled *Theory and calculation of alternating current phenomena* in the USA and who in 1916 built the first transmitter for the radio pioneer Reginald Fessenden.

The historian David E. Nye has explored an interesting source of Americans' enthusiasm for technology (which often provokes skeptical eye-rolling among us Germans). He investigated the role that the sublime plays in the history of American consciousness.[5] Whereas in German philosophy since Kant, the sublimity of nature has had the spiritual function of making the self aware of moral freedom, in America the sublime becomes a function of technology that overcomes the sublimity of nature (which is a more threatening wilderness there than it is in Europe). According to Nye, the technological sublime ultimately leads to an idea of reason that can be realized only in continuous technological progress. For Nye this is what gives rise to the ever-accelerating progress of technology, because consciousness demands constant confirmation. Perhaps this explains why engineers and inventors could become *the* social heroes in America.

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David E. Nye, *American Technological Sublime*, Cambridge, Mass.: MIT Press 1994. I am grateful to Paul DeMarinis for pointing this out to me.

Not so in Germany. Here, a strange ambivalent stance toward technology developed in the 19th century and persists to this day. It is an oscillation between enthusiasm for technology (to which avant-garde art succumbed in part in the early 20th century) and a critique of technology that battles against alienation and is articulated in the Frankfurt School, for example. Both stances are based on a concept of technique and technology that did not emerge until the end of the 19th century. In it, technology is seen as the rational implementation of science, which embodies rational thinking as such. Only theory can form the basis of a stable technology, said the scientific elite in Germany that was forming with the aid of the state, while at the same time the elite educated in the humanities looked down upon technicians and scientists. »Em-

piricism« — as the experience of engineers — even became a pejorative term at the end of the 19th century, and even Helmholtz, the director of the first state-operated major research institute, the Imperial Physical-Technical Institute, regarded technology merely as »higher watchmaking«.[6]
One may view this as the expression of a struggle for suitable places in a rigidified societal hierarchy or as the effect of ideological differences (for example, between determinism and a romantic view of nature). In point of fact, a gap still yawns in Germany between the humanities and the natural sciences. The associated polarity between culture and technology long prevented the history of science, sociology, and anthropology from combining (for example, in the form of Science and Technology Studies, STS) as they did in the United States after World War II. In France, Structuralism promoted a new view of the societal force of technology. In art (in Germany a classical domain of the humanities), connections to science and technology developed late and then, in the 1970s, as »media art«, into an important but rather peripheral field.

6 Joachim Radkau, *Technik in Deutschland vom 18. Jahrhundert bis zur Gegenwart*, Frankfurt a.M.: Suhrkamp 1989.

The view, widespread today, that technology is the fruit of science and develops more or less logically out of progressing knowledge thus crystallized late on both sides of the Atlantic. But this relationship seems to me to be also a consequence of the development of large-scale techno-scientific complexes, which developed at the end of the 19th century and became stabilized by the military in the 20th century.
It is astonishing how fast the idea was established that technical things owe their existence to a linear progress in a logical process of increasing efficiency. The concepts and devices from the epoch that Paul DeMarinis artistically explores, however, are not goal-oriented inventions in this sense, but more a result of bricolage and montage that aimed for goals other than what their further development might lead one to suspect. They are indeed based on lab devices and thought models that were developed to describe the forces of nature. But this did not guarantee that the technologies derived from them aimed straight for specific purposes. Edison, whose phonograph, in the course of its development, has fundamentally changed our understanding of music, was hard of hearing and had no interest in music. He saw his invention as a kind of dictation machine. Bell, who had a crucial role in the development of the telephone, was a teacher of the deaf and sought a technology for communicating with the deaf-mute. He experimented with the reconstruction of an apparatus built by Helmholtz, but misunderstood its mode of operation because he could not understand German (his model was the illustration of an electrically powered vocal resonator with tuning forks).
The technical prerequisites for constructing a phonograph had long been present. But why was Edison successful where his precursors weren't? Why didn't the physician and researcher Soemmering, recalled by parts of a work by DeMarinis (*The Messenger*, 1998), succeed in the breakthrough to telegraphy?
The American philosopher of technology Langdon Winner compares technical inventions to a black box. »When scholars open the black box of technological innovation, they find social, cultural and political choices through and through,« he says. »Things shed their tool-like qualities to become part of our very humanity.«[7] Opening the black box is not really a fitting metaphor, because it is characteristic of a black box that its contents are removed from perception and the genesis of the things can never be made completely known. Our ancestors' horizon of consciousness, their desire, their fears, dependencies, and solidarities are not easily accessible — especially not in a time in which awakening rational thought ran into natural forces (electricity and magnetism) that could no longer be tangibly explained. The applications that determine our lives today seem so natural to us that we no longer even ask about the forces of nature.

7 Langdon Winner, »How Technomania is Overtaking the Millennium«, in: *Newsday. Culture Watch*, November 23, 1997.

The astonishment and curiosity that once permeated all layers of society seems to have been extinguished from collective memory. History books hardly make any mention of it. Nonetheless, almost every workshop in Europe once

produced electrifying devices (to generate the strange force that made humans and animals twitch) — in fact, in such great numbers that they could be regarded as one of the first ubiquitous consumer goods. One must remember that electricity forced the people of the 18th and 19th centurycenturies to abandon a way of thinking based on a philosophical and religious tradition. This facilitated not only the rationalistic thinking of the Enlightenment, but also the aforementioned rise of irrational ideas. »Electricity« and »magnetism« became metaphors for mysterious vital powers that were expressed in the hearing of ghosts' voices, in strange medical theories (electrical baths), and in an increased interest in hypnosis: an intellectual heritage that is still equally powerful in Europe and America.

It is this historical space from which our civilization grew that Paul DeMarinis has in view. And what does he see? Media technologies are not the result of a sudden invention, but unite various strands of development that have varying historical depth. There is no linear growth of knowledge. At the margins of the convoluted paths of the history of technology and ideas lie many abandoned or forgotten projects, completed or unfinished devices and concepts. In this context form and function rarely seem to be logically related, at least from today's perspective. For example, how could Soemmering connect electrolysis with human communication? It begins to make sense when one notes that Soemmering was interested in the brain and the consciousness of self (his classification of brain nerves is still standard today). He thought that the cerebral ventricles had an integrating function for nerve signals. His writing on the organ of the soul (on which Kant wrote a commentary) was as intensely discussed as popular science articles on brain research are today.[8] And when the principle of hydrolysis was discovered, he combined it with his own theory on nerve pathways.

Paul DeMarinis calls the devices and concepts he encounters in his archaeological research »chimeras«. This expression for hybrid beings that appear strange to us in the arsenal of vanished and forgotten things recalls Bruno Latour's concept of »quasi-objects«: things that arise between nature and culture and that elicit new societal practices. »[W]e live in communities whose social bond comes from objects fabricated in laboratories,« says Latour.[9] What is special about the objects of electricity of the 18th and early 19th centuries is that they were produced in an interplay between experience and sensory perception, a process similar to artistic practice. This is probably the reason why these hybrid things are so attractive to an artist like DeMarinis.

From the viewer's perspective, integrating such technical artifacts in art is tied up with problems, because technical devices are not directly compatible with aesthetic perception. We are trained to strictly separate self-perception from the seeming objectivity of technology. In the natural sciences, this blocking out of subjectivity is the prerequisite for objective knowledge. This principle has penetrated into everyday perception and prevents us from seeing technical things as emblems of phenomena or as parts of a network. In other words, we are more interested in what can (or should) be done with them than in what they do to us. This aura of objectivity, combined with the tool-like qualities of technological things, leads us to orient ourselves more toward the classical art materials of sound and image and to tend to look for the messages conveyed by the apparatus.

Sound and image play a major role in DeMarinis' works, of course. They are important vehicles of meaning (the technological aggregates, too, are »pictures«). They also show that his devices work. But what is decisive is that they reveal a kind of thinking that is diametrically opposed to so-called modern technology. Its way of thinking — institutionalized and anonymized in giant structures — is characterized by acceleration and a loss of visibility. Moreover, its constantly renewed presence makes it impossible to perceive its history. DeMarinis' work opens up prospects onto hidden or repressed spaces that contribute to determining our present. His technologies are adjusted to the slowness of human perception and are transparent for their own past. His works draw their power of fascination from a great reservoir of techno-

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Samuel Thomas von Soemmering, *Über das Organ der Seele* (1796), Reprint Amsterdam 1966; see also: Peter Mc Laughlin, »Soemmering und Kant: Über das Organ der Seele und den Streit der Fakultäten«, in: *Soemmering Forschungen* 1 (1985), p. 191–201.

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Bruno Latour, *We Have Never Been Modern*, transl. by Catherine Porter, Cambridge, Mass.: Harvard University Press 1993.

logical practice, from a time when this practice still ran ahead of theory, before it subordinated itself to the seeming inevitability of modern theory development. In DeMarinis' works, the past begins to change (to speak with Latour). One can gain the impression that the »quasi-objects« are only waiting for someone to test their options for connecting within new spaces of action or at least to discover them as part of our history of consciousness. An artist like Paul DeMarinis, whose adeptness is not only technical, also shows us that the shaping of technology must not be delegated to the »experts«.

[translated by Mitch Cohen]



Das Makro- und das Mikrouniversum der Macht, die durch die alles verbindende Kette (nexus unionemque) verknüpft werden: Aus dem Auge Gottes entspringt das elektrifizierte Kreuz als Symbol für den Fleisch gewordenen Sohn, darunter die Insignien kirchlicher Regentschaft, aus denen die Ketten fallen, die den doppelköpfigen Adler unter Spannung setzen, der wiederum die Kronen der weltlichen Macht in den Krallen trägt, die magnetisch aneinandergefügt sind. Eine sehr säkulare Interpretation der kircherschen Idee vom großen Magnet Gott und seiner Anwesenheit in der Welt. (Frontispiz des in drei Bücher unterteilten *Magnes sive de arte magnetica*, Rom 1641)

Gott ist elektrisch, meine Seele ist elektrisch, die Natur ist elektrisch.

Siegfried Zielinski

Für Paul DeMarinis

Mit der Ankunft des Internet in der Massenkultur der frühen 1990er entwickelte sich, von Kalifornien ausgehend, eine ausgeprägte Metaphysik der Telekommunikation. Sie predigte die Ankunft der hochleistungsfähigen telematischen Netze wie einen Segen für die Menschheit und erklärte sie zum Allheilmittel für die Lösung ökonomischer, kultureller und politischer Probleme. Auch Teile der aktionistischen Diskurs- und Kunst-Szene betätigten sich als Missionare und versuchten Albanier, Bolivianer, Inder, Kroaten oder Litauer davon zu überzeugen, dass sie unbedingt und rasch ans Netz angeschlossen sein müssten, weil die Zukunft der individuellen und gesellschaftlichen Existenzen entweder on-line oder gar nicht wäre.

Paul DeMarinis ist für mich über all' die Jahre seines Schaffens ein wirksamer künstlerischer Gegenpol zu solchen Höhenflügen ohne Verortung gewesen. Im wahrsten Sinn des Wortes erdet er die abgehobenen Vorstellungen, indem er das Elektrische in Spannung mit dem Physischen und Lebendigen zum zentralen Element seiner experimentellen Praxis macht.

Wenn etwas sehr schnell schwingt, können wir es sehen, dann ist es Licht. Wenn etwas sehr langsam schwingt, können wir es spüren. Dazwischen, in den mittleren Regionen wahrnehmbarer Frequenzen, entfalten sich der Klang und die Hörigkeit. Der schlesische Physiko-Chemiker des Elektrischen, Johann Wilhelm Ritter, sagte, wir könnten dem verschwenderischen strahlenden Stern Sonne nicht etwas zurückgeben, was aus Licht wäre, da wir ihm alle strahlende Energie verdankten. Unser Gegengeschenk könnte etwas sein, was tiefer schwingt als wir selber: *gioia della vita*. Paul DeMarinis ist ein magischer Materialist mit ausgeprägter Lebensfreude.

Indem ich die barocke Idee des Magnetismus als Voraussetzung für die Gedankenwelt der *theologi electrici* diskutiere, werfe ich ein neues Licht auf die Experimentalkultur der Aufklärung. Sie wird in diesem kurzem Text nicht explizit diskutiert, sie kann aber mit Fug und Recht als eine der entscheidenden Quellen für eine künstlerische Praxis betrachtet werden, die durch technische Medien hindurch realisiert wird. Gelingt es mir nicht, durch meine Reflexionen hindurch Paul DeMarinis Arbeiten aufscheinen zu lassen, dann bin ich mit meinem Text gescheitert.

Herkünfte und Ideen einer Theologie des Elektrischen

I. Die genealogische Methode fragt nicht nach dem *einen* Ursprung eines Phänomens. Das beinhaltet nämlich die Setzung von *einer* Wahrheit. In der Folge Nietzsches und Foucaults interessiert sie sich vielmehr für die Fragen danach, wo etwas herkommt, und wie es sich entwickelt hat. Die Theologie des Elektrischen entfaltete ihre marginale, aber gleichwohl faszinierende Wirkkraft auf dem europäischen Festland in den ersten Jahrzehnten des 18. Jahrhunderts bis zum Höhepunkt der Aufklärung, des *Enlightenment*. Apparate zur Erzeugung stationärer elektrischer Spannung steckten technologisch ihren Rahmen ab. Die Konservierung schwacher Reibungselektrizität in der Leidener oder Kleist'schen Flasche wurde entdeckt. In Berlin, London oder Zürich veranstaltete eine Bande junger Experimentatoren spektakuläre Demonstrationen von leitenden und nicht leitenden Körpern, indem sie leichte Knaben und Mädchen wie lebendige Medien an die Decke hängten, unter schwachen Strom setzten, und sie so leichte Stoffpartikel anziehen oder entzündbare Flüssigkeiten wie Spiritus entflam-

Die übergreifende Sehnsucht, welche die Physiko-Theologen der Elektrizität antrieb, war wohl diejenige nach einem Zustand jenseits der Trennungen, die in den 100 Jahren Herausbildung moderner Naturwissenschaft sich zuvor etabliert hatten. Die Ausdifferenzierung der verschiedenen Wissenschaften in eigenständige Disziplinen und die Aufspaltungen zwischen den Künsten und den Wissenschaften, die mit der Etablierung der Moderne einhergingen, konnten in einer neuen Denkweise und einer neuen experimentellen Praxis überwunden werden. Mit der Elektrizität glaubte man endlich wieder eine symbolische Kraft für die Einheit von Geist und Materie, Leib und Seele gefunden zu haben: Gott ist elektrisch, meine Seele ist elektrisch, die Natur ist elektrisch. So ließe sich das Credo der *theologi electrici* zusammenfassen.[20] Wie unverschämt dieses Denken zu ihrer Zeit war, lässt sich daran ablesen, dass die Verwendung elektrischen Lichts »ad cultum« in der Kirche noch bis weit in das 20. Jahrhundert hinein verboten war. Es durfte nur eingesetzt werden, um Räume, die im Dunklen lagen, zu erhellen, auf keinen Fall aber in Ersetzung des liturgischen Wachslichts auf dem Altar oder gar des ewigen Lichts vor dem Allerheiligsten.[21] Welch' Blasphemie stellt auf diesem Hintergrund die Elektrifizierungsoffensive in italienischen Gotteshäusern dar. Zu Beginn des 21. Jahrhunderts ist es schwierig geworden, in Neapel, Apulien, Kalabrien oder Sizilien noch traditionelle Wachskerzen in den Kirchen zu finden.

20
Vgl. Ebd., S. 67.

21
Michael Buchberger [Bischof von Regensburg], *Lexikon für Theologie und Kirche*, Band 3, Freiburg Brsg.: Herder 1931, S. 618.

IV.

Im öffentlich zur Schau getragenen Experiment fanden die Theologen des Elektrischen und ihre technisch ambitionierten Freunde starke Bilder und Metaphern. Der Kuss der »elektrisierten Venus«, den Georg Matthias Bose (1710–1761) in Berlin als Salonexperiment installierte, war eine der spektakulären *performances*. Junge Frauen wurden mit dem elektrischen Fluidum durchflutet, auf einen isolierenden Schemel gestellt und durften von Party- oder Vortrags-Besuchern geküsst werden, nachdem sich an ihren elektrisierten Lippen ein Funken entladen hatte. Den männlichen Gästen jagten dabei mehr oder weniger wohlige Schauer über den Rücken. Je nach Stromstärke kam es allerdings auch zu regelrecht erschütternden Erfahrungen. Einzelne Probanden berichteten über ausfallende Zähne und andere üble Torturen.

Im zweiten Band der berühmten, von Wiegleb umgearbeiteten, »natürlichen Magie« von Martius (1786) können wir vortrefflich studieren, wie stark diese Experimentalkultur am Ende der Aufklärung bereits popularisiert war.[22] In der ersten Tafel des Anhangs wird prominent das Experiment mit einem gerahmten Gemälde beschrieben, dessen wie Gold anmutende Bestandteile gezielt unter Strom gesetzt wurden, um allzu habgierigen Besuchern kleine Schocks beibringen zu können. Bei seinen elektrifizierten Texttafeln, die man als frühe Zeitbilder interpretieren kann, standen jene Sujets im Zentrum, in denen die Strategien des Scheins seit Jahrhunderten wesentlich exerziert werden: Spiegel, Liebe, Geld. In den Bildern des Jugendstils, vor allem bei Gustav Klimt, geriet später alles in Fluss. Schöne hell glänzende Frauenkörper mit langem wellendem Haar schlängelten sich über die wunderschönen Oberflächen der Leinwände. Lange jedoch, bevor sich die Spezialeffekte schließlich als elektronische und digitale Operationen nur noch im Bild austobten, wurden sie physikalisch installiert und physio-psychologisch angewendet.

22
Johann Nikolaus Martius, *Unterricht in der natürlichen Magie, oder zu allerhand belustigenden und nützlichen Kunststücken; völlig umgearbeitet von Johann Christian Wiegleb*, Berlin und Stettin: Friedrich Nicolai 1786.

Eine Art Master-Experiment für das Feiern der Ideen einer Theologie des Elektrischen hatte sich wohl auch Matthias Bose ausgedacht: Einer Versuchsperson, die in der Regel weiblich war, wurde an den Schultern hinter dem Kopf ein metallener Bogen aufgesetzt. Elektrisiert strahlte er in hellem Glanz, womit der Person eine Art Heiligenschein verliehen wurde. Das Experiment nannte man Beatifikation. Es soll viele Nachahmer gefunden haben. Eine kitschige Inszenierung am Rande des guten Geschmacks, die aber im Kern nicht so weit weg von jener »Vermaterialisierung des Geistigen« zu verorten ist, wie sie Joseph Beuys für die moderne Kunst in der zweiten Hälfte des 20. Jahrhunderts gepredigt hat.[23] Er sprach gern in romantischer Verklärung von »der allgemeinen, offenen, lebendigen, fließenden Substanz«, die

23
Es ist sehr lohnenswert, wesentliche Teile seines installativen Werkes mit den Hauptbestandteilen Filz, Kupfer, diverse Fette, aber auch die vielen Zeichnungen zum Energetischen unter dieser Perspektive zu interpretieren. Einen wertvollen Ansatz hat Theodora Vischer in ihrem Buch *Beuys und die Romantik – individuelle Iko-[illegible] individuelle Mythologie?* (Walther Kö-[illegible]) unternommen.

alles durchdringe. In der Retrospektive, die 2008 zu Ehren von Beuys im Hamburger Bahnhof Berlin veranstaltet wurde, lag in der ersten Vitrine ein Büchlein des Physiko-Chemikers Johann Wilhelm Ritter: »Physik als Kunst« (1806).

God is electrical, My soul is electrical, Nature is electrical.

Siegfried Zielinski

For Paul DeMarinis

With the arrival of the World Wide Web in 1991 a distinct metaphysics of telecommunications developed, which originated in California. It extolled the advent of the high performance telematic networks as a blessing for humankind and proclaimed them a universal remedy for curing all economic, cultural, and political ills. Certain sections of the actionist discourse and art scenes also joined in as proselytisers and sought to convince Albanians, Bolivians, Indians, Croatians, and Lithuanians, for example, that they must get hooked up to the Net as fast as possible because the future of individual and social existence was going to take place online or not at all.

The entire artistic career and body of work of Paul DeMarinis is, for me, an efficacious artistic antidote to such flights of fancy without ground control. In the true sense of the word Paul DeMarinis earths such out-of-touch notions by making that which is electric — in concert with that which is physical and animate — the central element of his experimental praxis.

When something vibrates very fast, we can see it for then it is light. When something oscillates very slowly, we can only feel it. In the median regions of perceptible frequencies there is sound and hearing. The Silesian physicochemist of things electric, Johann Wilhelm Ritter, said that if we were to give something back, as a gift, to the extravagantly radiant star that is our sun, it could not be something made of light, because we have the sun to thank for all our energy. Our return gift to the sun could be something that vibrates more slowly than ourselves: *gioia della vita*. Paul DeMarinis is a magical materialist with an enormous zest for life.

By discussing the Baroque Age's concept of magnetism as a prerequisite for the world of the so-called *theologi electrici*, the electrical theologians, I bring new light to bear on the culture of experiment in the Age of Enlightenment. I do not explicitly discuss this concept here, but there is ample justification for considering it one of the decisive sources for artistic praxis realised through technological media. If these reflections do not allow the works of Paul DeMarinis to shine through, then my text has fallen short of its intention.

Origins and Ideas of Electrical Theology



The macro- and micro-universe of power, which are connected by the chain that links everything (nexus unionemque). From the eye of God issues the electrified cross, the symbol of his son that became flesh; under the cross are the insignia of the regency of the church from which the chains fall that electrify the double-headed, eagle, which clasps in its talons the crowns of temporal power that are joined together magnetically. A very secular interpretation of Kircher's idea of God as a great magnet and his presence in the world. (Frontispiece of the three books of *Magnes sive de arte magnetica*, Rome 1641.)

I. The genealogical method does not enquire about any *one* origin of a phenomenon. That would imply postulating a truth. In conformity with Nietzsche and Foucault, the genealogical method is far more interested in where something comes from, and how it has developed. Electrical theology unfurled its marginal, but fascinating effects in Europe, in the first decades of the eighteenth century, and ended at the apogee of the Age of

Enlightenment. Technologically, it was framed by apparatus to generate and store static electricity. With the invention of the Leyden jar it became possible to conserve weak electrical charges produced by friction. In Berlin, London, and Zurich bands of young experimenters put on spectacular demonstrations of conducting and non-conducting bodies in which slender boys and girls were suspended from the ceiling like living media, and the children's bodies, electrified with a weak electric charge, attracted scraps of thin material or they ignited inflammable liquids like methylated spirit with sparks from their fingertips. Other experimenters also had the temerity to encroach on God's turf, like Benjamin Franklin (1706–1790) in Philadelphia or Prokop Diviš (Czech: Václav Divíšek, 1698–1765), who independently tamed the destructive natural force of lightning with technology.

In short: »Electricity is the new admiration of all«, as the philosopher, philologist, and naturalist Johann Heinrich Winkler (1703–1770) wrote.[1] It was celebrated as the radiant »youngest daughter of the sciences« (Joseph Priestley).

1
Johann Heinrich Winkler, *Gedanken von den Eigenschaften, Wirkungen und Ursachen der Electricität*, Leipzig 1744, p. 7.

The electrical theologians drew their inspiration mainly from the early modern era. The first systematic account of magnetic phenomena in early modern times is credited to William Gilbert (1540–1603). His treatise *De magnete* of 1600 was a deliberate and bold enterprise. As in a modern dissertation, Gilbert described the state of contemporary knowledge about magnetism, the effects of lodestone and amber, which had been known since antiquity, as well as of many other minerals. He carefully classified them and grouped them in the category of »electrica«. Gilbert understood magnetism as a non-material manifestation of the soul of the Earth, whereas in his view electricity always had a material cause. Magnetism was a persistent, invisible force acting from a distance: tele-action, tele-comunication in the direct meaning of the term. By contrast, electrical effects were more ephemeral and influenced by many factors.

In Gilbert's theory religion played no role at all. He was an excellent physician, specialised in handling material bodies and, like the mathematician, cartographer, and alchemist John Dee, he attended the court and the person of Elizabeth I. (he was her own physician from 1601 to 1603) — a sovereign defamed and ostracised by the Roman Catholic church. A pressing worldly problem that Gilbert desired to contribute to solving was navigation. Ultimately, the issue was political and economic ascendancy on the seas: how to achieve the most exact measurements possible with magnetic compasses, including in bad weather conditions. From his experiments William Gilbert concluded that the Earth's magnetic field originated in the planet's interior — that is, that the Earth itself is a magnet — and the interior must consist of iron. It certainly wasn't the pole star or some alleged large magnetic island at the North Pole that caused compasses to point north. And in no way was God the Great Pulsator (Robert Fludd) responsible.

Such heresies, which openly sympathised with the Copernican view of the universe, were fought against by all good Catholics with the quasi militaristic vanguard of the Jesuit order leading the way. Their headquarters in Rome, the Collegio Romano, near the Piazza Venezia, trained and educated the Roman Catholic intellectual elite. For several decades the Collegio Romano was headed by the German Jesuit Athanasius Kircher, to whom Eugenio Lo Sardo devoted an exhibition in 2001 on the occasion of the 400th anniversary of Kircher's birth, just around the corner from the Jesuit college in Rome.[2] Over the past ten years the celebration of Athanasius Kircher has reached inflationary proportions; in fact, it matches his own literary output during his lifetime.[3]

2
See Eugenio Lo Sardo (ed.), *Athanasius Kircher S. J. – Il Museo del Mondo*, Rome 2001.

3
See Joscelyn Godwin, *Athanasius Kircher's Theatre of the World*, London: Thames and Hudson, 2009.

Operating with an indissoluble conjunction of Catholic deism, art, and natural philosophy, in various fields of knowledge Kircher pursued one central idea — in the literal sense of the word: the world we can experience is anything but peaceful and harmonious. It consists of dissonant multiplicity with severe contradictions and tensions. All experiments with nature and all arts — like religion — have the noble task of bringing about peace and harmony,

of making from this multiplicity discordant concord or concordant discord, as Kircher expressed it in his Baroque music theory, *Musurgia universalis*. *Ars magna lucis et umbrae* (The great art of light and shadow) pursues the same idea with reference to the posited bipolarity of optics. In Kircher's principal work on the subject of geology, *Mundus subterraneus*, everything on Earth is determined and regulated subterraneously by a »central phenomenon«, the power of fire. Kircher erects the book's »Centrosophia« upon this element, which the Greek Sicilian poet-philosopher Empedocles, who according to legend threw himself into the fiery crater of Mount Etna, singled out as his main attraction. Kircher had been deeply impressed by a voyage from Messina to Naples in 1638 during which all three southern Italian volcanoes — Etna, Vesuvius, and Stromboli — were erupting and earthquakes caused the sea to seethe and bubble.[4]

Magnes sive de arte magnetica (The magnet or the magnetic arts) of 1641 was Kircher's first published book. Analogous to the fire in the Earth's interior he understood magnetism as a hidden force holding the world together on the inside, as an elemental force of nature that is effective everywhere in the universe (movement of the planets and stars), in the greatest and smallest organisms whether animals or plants, as well as in the love between the poles of the two sexes. The symbol of this energy was for Kircher the chain, which linked the dead and living phenomena as well as the various disciplines of knowledge: »nexus unionemque«, as Kircher wrote — the chain that connects everything. The various meanings that are connoted by this word, which in Latin sounds a little like »net«, do not only belong to a positive phylum of connections, but include convolution, entrapment in guilt, and enslavement. In Latin »nex« is a violent death, murder, execution; »nexus« is connection, tie, entanglement, and it is also a relationship of power, like the strange, invisible force of magnetism, which attracts and repels.

Kircher was a good and faithful servant of his master in Rome. He had no interest whatsoever in shaking the Catholic edifice of knowledge, administered by the Vatican, to its foundations, on the contrary: he wanted to expand it and make it appear in such a shining light that throughout the entire world it could be implemented as the master architecture for all thought and feeling. His concept of magnetism as an energy that flowed through the world held fast to the idea of the Great Pulsator, to Meta-magnet God, who created the oscillations and omnipotently governed the »consortiums & dissidiums«, consorting and being at variance.[5] Yet Kircher did intuit the explosive potential that lay in his conception of the magnet. In the Preface to *Magnes* of 1641 he wrote: »We are investigating the coherence of the entire universe and all of its physical things in a new and unique way. Whosoever possesses the key to this method, he should know that he will find the door open to knowledge about all hidden things; indeed, to the true wisdom that also philosophers strive for, which they call magic, and to the secrets of that true philosophy.«[6]

II. Around fifty years later, the methods whereby the relationship between God and nature was conceived scientifically and even empirically had undergone a radical transformation, not least due to the influence of René Descartes and Isaac Newton. At the beginning of the eighteenth century there was a veritable wave of experimental theology which in the practice of the natural sciences represented an attempt to comprehend God better and to pass on knowledge about Him to others. All these approaches were grouped under the name »physico-theology«. One of their characteristics, however, was that they appeared in many variants, devoted to a particular aspect of nature, for example, insecto-theology (entomology), bronto-theology (study of thunder and lightning), litho-theology (petrology), or ichthyo-theology (ichthyology).[7]

Physico-theology had connections with Pietism, which since the seventeenth century had become established as a particularly Bible text-oriented and social variant of Protestant conceptions of God, which in turn had connections with British Puritanism.[8] The physico-theologians also worked on a new version of

4
All the books by Kircher mentioned in this chapter are discussed at length in my *Deep Time of the Media*, trans. G. Custance, Cambridge, MA: MIT, 2006.

5
This formulation is very similar to something Kircher might have written, but is actually taken from *Conciliator philosophicus* (1609) by the German philosopher Rudolf Goclenius (Goeckel) (1547–1628).

6
Athanasius Kircher, *Magnes sive de arte magnetica*, Rome 1641.

7
See Myles W. Jackson, »Elektrisierte Theologie. Johann Heinrich Winkler und die Elektrizität in Leipzig in der Mitte des 18. Jahrhunderts«, in: *Musik, Kunst und Wissenschaft im Zeitalter Johann Sebastian Bachs*, Hildesheim: Olms, 2005, p. 61.

8
Such a bizarre genealogy has not yet been written, but perhaps it is possible to establish links between the British Puritans and the cybernetic West Coast Hippies of the USA.

the concept of nature, as well as of its Creator and Mover, or to be more precise: of God in nature. Let us consider an example of how this worked.

John Freke (1688–1756), for example, was a theologically well-versed English surgeon who worked at St. Bartholomew's Hospital in London. Freke specialised in diseases of the eye, designed several medical instruments, and caused a stir with an early natural philosophical-theological essay on electricity. Elected in 1729 as a Fellow of the Royal Society — the aristocratic custodian of all knowledge about nature and its technical applications in the Kingdom of Great Britain — in 1746 Freke wrote »A Treatise on Electricity«.

For Freke electricity is the primary phenomenon of the sublunary world, »the First Principle in Nature« as he wrote in the Appendix to his treatise with the exceptionally long title.[9] With the early machines in mind that were used to produce frictional electricity, Freke places particular emphasis on stating that the »electrical fire« does not originate in the »apparatuses« or in any of their physical components. Instead, electricity resides in the air, which he calls »paebulum vitae«, nourishment or food of life. Thus for Freke electricity is inextricably bound up with all things living, and it permeates the animal as well as the vegetable and the mineral. It makes the blood red (»rubefying the blood«) and is therefore »flamma vitalis«, the very flame or fire of life.[10] Analogous to Robert Fludd's designation for the sun, Freke also refers to electricity as »anima mundi«, the world soul that animates all nature.

In the technical section of his essay, Freke demonstrates that he is fairly well-acquainted with the up-to-date knowledge of his day, describing simple devices for generating electricity and listing materials that are good and bad conductors. He is particularly taken with the »excrement of bees«, wax, which cannot be electrified. And he describes exactly what happens when an electrified body meets a non-electrified body; when the electricity jumps over from one body to another and the electrical fire discharges acoustically with a crackling sound and optically with a spark:[11] electrical audiovision in its most archaic form.

However, one of the most striking and mysterious formulations for a theology of electricity is found in Freke's Preface. With electricity one becomes directly acquainted with the »*Officer* of God Almighty«.[12] This term not only carries the meaning of the execution of a function, but also the notion of an indicator: electricity becomes a display of the actions of God.

III.

Freke comes surprisingly close to Kircher's theological interpretation. The Pietists Friedrich Christoph Oetinger (1702–1782) and his student Johann Ludwig Fricker (1729–1766) from Württemberg, or Prokop Diviš (1698–1765) from Helvikovice in Bohemia, who with his *Denis d'Or* [The Golden Divis] is reputed to have built the first electrified musical keyboard instrument in history, had a far more radical orientation on the world than either Kircher or Freke, for example. Their texts were not published in lavishly illustrated folio editions or submitted to venerable societies for discussion; on the contrary, many were censored and they remain difficult to access even today.[13]

For these thinkers physico-theology as electrical theology signified the opportunity to think of God and natural philosophy once more as a unity. Like the phenomena of galvanism and magnetism, the discovery of electricity they combined with the idea of the direct presence of God in the world, and, attendant on this new concept of God, with a new understanding of »soul and corporality, of spirit and substance, of life and matter«. At once replacing and supplementing medieval metaphysics of light they drew a new image of contemplating the Divine: »magnetism and electricity seemed to be the most evident depiction of the hidden presence of the divine force in the world and in things, as the hidden power that creates life, motion, and heat, which permeates the entire universe«.[14]

What Kircher had only alluded to, the electrical theologians put into effect with varying degrees of radicality: »God the magnet becomes [...] the magnetic force in nature. The de-personalisation of the idea of God leads in the

9
John Freke, *A Treatise on Electricity, An Essay to show the Cause of Electricity and why some things are Non-Electricable. In which is also Considered Its Influence in the Blasts on Human Bodies, in the Blights on Trees, in the Damps in Mines; and as it may affect the Sensitive Plant.* The Second Edition: With an Appendix, London: W. Innys, 1746, p. 59.

10
Ibid., p. 3ff., and p. 4 (condensed summary).

11
Ibid., p. 36f.

12
Ibid., Preface, p. V.

13
In addition to Oetinger's writings there is also his scattered correspondence with Prokop Diviš and Fricker, articles in lexica, and entries in handbooks in Catholic encyclopaedias. Ernst Benz has published his dissertation on »Theologie der Elektrizität« (Wittich/Darmstadt/Mainz, 1970), and in Italy (Bologna) there is a Ph.D. thesis by Paola Bertucci, which engages with authors such as John Freke; to my knowledge it has not been published. Bertucci's work contains a chapter on »electric fire and the ›Theologia Theutonica‹«, which bears this name because it is strongly influenced by Jacob Boehme's theosophy and its dualistic understanding of vital energy, which also influenced Johann Wilhelm Ritter. The doctoral dissertation by Benz has been translated into English: *The Theology of Electricity: On the Encounter and Explanation of Theology and Science in the Seventeenth and Eighteenth Centuries*, Princeton Theological Monograph Series, Pickwick Publications, 1990.

14
[illegible] 1970, pp. 6 and 7.

direction of practically equating the Divine Spirit, as the *vis magnetica dei*, with the all-ensouling force of nature«.[15]

What made such a construction possible was that electricity cannot be directly identified as such by our sense faculties; »We do not have [...] an electrical sense«, wrote Graetz at the end of the nineteenth century.[16] Electricity cannot be smelled or felt, tasted, heard or seen. Only when it comes into contact with and flows through matter it is experienced as heat, motion, vibration, or light. Electricity is the »ideal manifestation of distance« in the present here and now; when the stress ratios are right, current flows and the archaic forces of attraction and repulsion develop. Walter Benjamin's concept of the aura is epistemologically not far away from that of the ether, in which the unfixable was given a name. John Freke has also much to say on this subject.

A key text for the *theologi electrici* of the German Enlightenment was the dissertation by the theologian Gottlieb Friedrich Rösler from Tübingen of 1764. Systematically building on the ideas of Kircher, Rösler interpreted the electric fire as the light of the first day of the Creation and declared it to be the world spirit that flows through all things: *spiritus mundi*. The electrical fire of nature in Rösler's understanding was something that was inherent in nature, something that dwelt within nature in the directest sense. It became the »principle of life, which presses forward to become ever new forms, which seeks to realise itself in ever new life forms«. Thus, in this view electricity is a *universal phenomenon*, and with regard to humankind is declared an anthropological principle.

For the electrical theologians it seemed »blasphemy to assume that God created a form out of dead dust, into which He subsequently breathed life. Even the dust, from which God formed man, carried within itself the electrical fire, even to the dust there appertained a sensate soul. The act of breathing life [into man] is not the same as the first act of ensoulment but represents a subsequent, second act: endowing humans with rationality, with mind.«[17] In his Biblical and Emblematic Dictionary, Oetinger wrote »There is twofold life in humans, the sensate and the rational: the first is electrical, the second goes far beyond electricity: it is not possible to determine its limits.«[18]

References to Pre-Socratic philosophers by these thinkers are not confined to the corporeal or organic dimensioning of the spirit and the definition of magnetic force as attraction and repulsion, war and peace, which stems from Empedocles. There are manifest echoes of ideas that originated with the Atomists. »In every body,« wrote Oetinger, for example, »the very tiniest fiery particles are encased that participate in forming the greater body.«[19]

The overarching aspiration that drove the physico-theologians of electricity was the vision of a time that did not yet know all the divisions and separations that had developed over the course of the previous century in which modern science established itself. The splitting up of science into various disciplines, the divide between the arts and sciences — all this they wanted to resolve and overcome by instituting a new, alternative way of thinking about science and a new praxis of experimenting. In electricity they believed to have at last found a force that symbolised the unity of spirit and matter, of body and soul: God is fire, my soul is fire, Nature is fire.[20]

An indication of how presumptuous this thinking was in its time can be judged from the circumstance that the use of electric light in churches »ad cultum« was forbidden until well into the twentieth century. Electric lighting was only permitted in dark rooms or areas, but on no account as a replacement for altar candles or the sanctuary lamp.[21] What a sacrilege it must have seemed when Italian churches began their offensive of electrification. At the beginning of the twenty-first century it is difficult to find any traditional candles in churches in Naples, Apulia, Calabria, or Sicily.

IV.

In experiments performed in front of audiences the electric theologians and their technically ambitious friends created powerful images and metaphors. The kiss of the »electrifying Venus«, which its inventor the physicist Georg Matthias Bose (1710–1761) installed as an experi-

15
Ibid., p. 14 (condensed summary).

16
Leo Graetz, *Die Elektrizität und ihre Anwendungen. Zur Beleuchtung, Kraftübertragung, Metallurgie, Telephonie und Telegraphie*, Stuttgart 1883, Einleitung, S. XI.



Electrical offertory box in a church in Apulia, a component of the electrification offensive in southern Italy in the early twenty-first century. The immediate effects are hygiene and rationalisation. Helpers are no longer needed to clean the auratic offertory boxes and replenish the candles. Their aura has been supplanted by an »auretta«, the Italian diminutive of the word. The artefact pictured has a metallic grey keyboard. Photo: Mono Krom, 2009

17
Cited in Benz 1970, p. 58.

18
Friedrich Christoph Oetinger, *Biblisches und Emblematisches Wörterbuch*, reprinted with a preface by Dmitrij Tschizewskij and Ernst Benz in »Emblematisches Cabinet«, Hildesheim 1969, p. 400.

19
Ibid., p. 204.

20
This is the original quotation by Oetinger from the entry on »Fire« in the *Biblisches und emblematisches Wörterbuch* (p. 205), which Ernst Benz transformed and appears as the title of this essay (Benz 1971, p. 67).

21
Michael Buchberger [Bishop of Regensburg], *Lexikon für Theologie und Kirche*, vol. 3, Freiburg im Breisgau: Herder, 1931, p. 618.

ment in Berlin salons, was one of the most spectacular. An attractive young lady standing on an insulated stool was charged by means of an electrostatic generator. Gentlemen from the audience or party guests were invited to kiss her, but before their lips touched a strong spark flew between them giving the man an electric shock. Its intensity depended on how strong the woman had been charged; the men may have just experienced a pleasurable frisson, but some reported very painful experiences including broken teeth.

The second volume of Martius' famous book on »natural magic« in the completely revised version by Wiegleb of 1786 provides an excellent illustration of just how popular and widespread this culture of the experiment had become by the end of the Enlightenment.[22] The first plate in the Appendix describes an experiment with a painting in a frame where the elements that looked like gold were electrified to administer electric shocks to any light-fingered visitors. Electrified text panels, which can be seen as early testimonies of the period, focused on subjects that have served strategies of appearance and semblance for centuries: mirrors, love, and money. Later, in Art nouveau paintings, especially by Gustav Klimt, everything is again in a state of flux. The bodies of fair-skinned women with long wavy hair meander across the gorgeous canvasses. Long before special effects became purely electronic operations running riot in the digital image, such effects were installed physically and were utilised physio-psychologically.

A kind of master experiment was thought up by Matthias Bose to celebrate the ideas of electrical theology: a volunteer, usually female, sat on a chair and a metal contraption was placed on their shoulders behind the head. When electrified a luminous halo formed above the volunteer's head. The experiment was known as »beatification«, and apparently there were many imitators. A kitschy performance in rather poor taste, the essence of which, however, is not that far removed from the »materialisation of thought« that Joseph Beuys preached for Avant-garde art in the second half of the twentieth century.[23] In Romantic idealisation Beuys often referred to the »universal, open, living, flowing substance« that permeates all things. In the 2008 retrospective exhibition mounted in Beuys' honour in Berlin's Hamburger Bahnhof gallery, the first vitrine contained a small book by the physico-chemist Johann Wilhelm Ritter with the title »Physics as Art« (1806).

[translated by Gloria Custance]

22
Johann Nikolaus Martius, *Unterricht in der natürlichen Magie, oder zu allerhand belustigenden und nützlichen Kunststücken; völlig umgearbeitet von Johann Christian Wiegleb*, Berlin and Stettin: Friedrich Nicolai, 1786.

23
It is a worthwhile exercise to interpret Beuys' installations that use felt, copper, and various fats from this perspective as well as his many drawings that take up his concept of energy. A useful approach can be found in Theodora Vischer's book *Beuys und die Romantik – individuelle Ikonographie, individuelle Mythologie?*, Cologne: Walther König, 1983.



Johann Nikolaus Martius

Unterricht

in der

natürlichen

Magie,

oder

zu allerhand belustigenden und nützlichen

Kunststücken;

völlig umgearbeitet

von

Johann Christian Wiegleb.

Zweyter Band.

Mit Kupfern.

Berlin und Stettin,

bey Friedrich Nicolai,

1786.

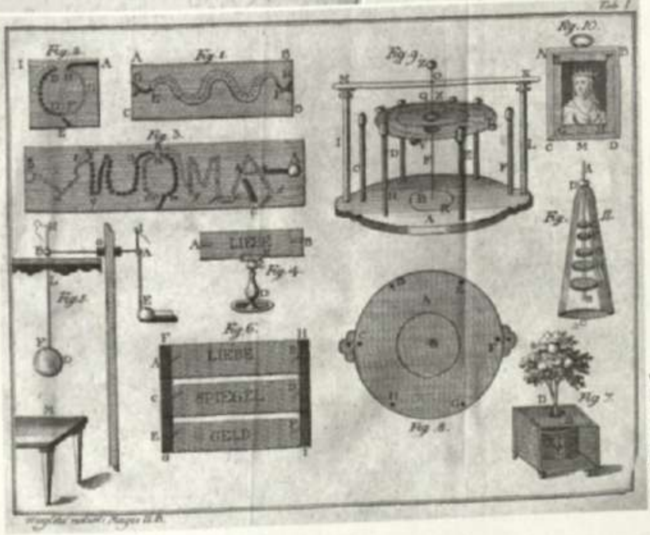


Innhalt.

I. Elektrische Kunststücke.

II. Magnetische Kunststücke.

15



Wiegleb's revised version of Johann Nikolaus Martius' famous book on natural magic contained in the second volume (1786) numerous electrical tricks, which are listed in the table of contents. Creating the appearance of pretty fictions (glowing paintings or letters of the alphabet) in the electrical mise-en-scène of money, mirrors, and love belonged to the basic repertoire of practical natural magic.



The Race That Wasn't One: Oskar Fischinger, Rudolf Pfenninger, and the »Discovery« of Synthetic Sound*

Thomas Y. Levin

← Rudolf Pfenninger in his laboratory with hand-drawn sound strips, 1932 (Pfenninger Archive, Munich). / Rudolf Pfenninger in seinem Labor mit handgezeichneten Tonstreifen, 1932 (Pfenninger-Archiv, München).

In a classic instance of the curious simultaneity that is the repeated hallmark of the overdetermination governing the history of invention, during the early 1930s a number of people in various parts of the world were working furiously but independently on experiments in what they referred to variously as »handdrawn,« »animated,« »ornamental,« and/or »synthetic« sound. Besides the British physicist E. A. Humphries in England, in the Soviet Union there were, according to some accounts, no less than three separate groups of researchers working on hand-drawn sound in Leningrad and Moscow: their ranks included figures such as the composer, music theorist, and performance instigator Arsenii Avraamov; the painter, book illustrator, and animator Mikhail Tsekhanovskii; the engineer Evgenii Sholpo; the animators Nikolai Voinov and Nikolai Zhilinski; and the inventor Boris Yankovskii. While space considerations preclude anything more than a cursory treatment of these crucial Soviet contributions here, it should be noted that these groups produced some extremely important theoretical and practical results, not least being the development of a protosynthesizer called the »Variofon« and another known as the »Vibro-Eksponator.«[1] At exactly the same time, and as far as I can tell without any knowledge of what was being done in the Soviet Union, similar efforts were also being undertaken in Germany by Rudolf Pfenninger in Munich and, somewhat later, by Oskar Fischinger in Berlin. Fischinger's widely discussed experiments and lectures during the years 1932–1933 grew out of his extensive earlier work in nonobjective, abstract, or, as he preferred to call it, »absolute« film, which explored the musicality of moving graphic form in the tradition of animated cinematic synesthesia established by the filmmakers Viking Eggling, Hans Richter, and Walther Ruttmann.[2] The first concrete result of these explorations in the relations between musical and graphic elements in time (which the contemporary critic Bernhard Diebold referred to with the charming neologism »Muso-Graphik«[3]) was Fischinger's compilation *Experimente mit synthetischem Ton* (Synthetic sound experiments), which was composed of »patterns, drawn on paper with pen and ink and photographed directly onto the margin of the film reserved for

*
This is a chapter from a longer study which first appeared in German as »›Töne aus dem Nichts‹. Rudolf Pfenninger und die Archäologie des synthetischen Tons« in: Friedrich Kittler, Thomas Macho and Sigrid Weigel, Eds., *Zwischen Rauschen und Offenbarung: Zur Kultur- und Mediengeschichte der Stimme*, Berlin: Akademie Verlag, 2002, pp. 313–355, and then in English as »Tones from out of Nowhere: Rudolf Pfenninger and the Archaeology of Synthetic Sound« in: *Grey Room* 12 (Fall 2003): 32–79.

1
One of the few texts in English that focuses on this fascinating and largely unknown chapter is Nikolai Izvolov, »The History of Drawn Sound in Soviet Russia,« trans. James Mann, *Animation Journal* 7 (Spring 1998): 54–59. See also Hugh Davies, »Avraamov, Arseny Mikhaylovich,« in *New Grove Dictionary of Musical Instruments* 1, ed. Stanley Sadie, London: MacMillan Press, 1984, p. 91; Davies, »Sholpo, Evgeny Aleksandrovich,« in *New Grove Dictionary of Musical Instruments* 3, p. 377; and Davies, »Variaphon« [*sic*], in *New Grove Dictionary of Musical Instruments* 3, p. 716. On Humphries see »Synthetic Speech Demonstrated in London: Engineer Creates Voice Which Never Existed,« *New York Times*, 16 February 1931: 2.

2
The most extensive and well-informed overview of Fischinger's work can be found in William Moritz, »The Films of Oskar Fischinger,« *Film Culture* 58–60 (1974): 37–188. More recently, Moritz contributed a lengthy study, entitled »Oskar Fischinger,« to the catalogue *Optische Poesie: Oskar Fischinger Leben und Werk*, Frankfurt a. M.: Deutsches Filmmuseum, 1993, p. 7–90. On the history of early abstract cinema, see also *Film as Film: Formal Experiment in Film, 1910–1975*, London: Hayward Gallery/Arts Council of Great Britain, 1979, p. 9–35; Standish Lawder, »The Abstract Film: Richter, Eggeling and Ruttmann,« in Lawder, *The Cubist Cinema*, New York: New York University Press, 1975, p. 35–64; and Hans Richter, »Avant-Garde Film in Germany,« in *Experiment in the Film*, ed. Roger Manvell, London: The Grey Walls Press, 1949, p. 219–233.

3
As reported in numerous journalistic accounts of Diebold's lectures on »den gezeichneten Film« (hand-drawn film) in the Südwestdeutschen Rundfunk (»Bernhard Diebold vor dem Mikrophon,« *Frankfurter Zeitung*, 18 June 1932) and in the cinema Kamera Unter den Linden (H.A., »Bernhard Diebold über Fischingerfilme: ›Das ästhetische Wunder,‹« *Lichtbildbühne*, 1 June 1932).

the sound track.«[4] Fischinger's practice of making drawings on paper that would then be photographed onto the optical film sound track supposedly was inspired by his experience of hearing a key drop; struck by the fact that he recognized what he heard *as the sound of a key*, Fischinger wondered whether every shape had a corresponding sound, a sort of iconic acoustic signature. According to William Moritz, this led Fischinger to undertake not only a series of experiments that examined the relationship between visual forms and their corresponding sonic manifestations, but also various attempts at

> drawing designs and ornaments which produced »a-musical« sounds; he found, for example, that the pattern of concentric wave-circles which was often used in cartoon and silent film iconography to represent the ringing of a door or alarm bell actually produced a buzzing clang sound when drawn in long rows and photographed onto the soundtrack area.[5]

Intrigued by the potentially far-ranging ramifications of such acoustico-visual isomorphism, Fischinger often speculated as to whether there was more than an accidental relationship between the physical shape of an object and its auditory manifestation. Might there exist some deep and previously inaccessible common structural logic that governs both the most prevalent ornamental practices of a given society and its dominant auditory patterns? Posing the question in rather explicitly nationalistic terms in a widely published 1932 essay, Fischinger states:

> Personal, national and characteristic traits naturally will also be expressed in the ornament. In terms of their vocal intonation Germans tend to make a strong attack which corresponds to a specifically jagged curve whereas the soft vocal attack of the French also manifests itself in a correspondingly different fashion in the ornament. There is thus an equally clear »mouth-writing« as there is »hand-writing.«[6]

These and other related questions were the focus of investigations that Fischinger presented to great public acclaim in a lecture on synthetic sound at the Haus der Ingenieure in Berlin in the first week of August 1932.[7]

Long before the appearance of Fischinger's well-publicized explorations into the aesthetics of »tönende Ornamente,« a little-known animation filmmaker and engineer named Rudolf Emil Pfenninger (1899–1976) had been busily at work in the Geiselgasteig studios of the Münchener Lichtspielkunst AG (EMELKA) perfecting what would turn out to be the first fully functioning and fully documented (i.e., not apocryphal) *systematic* technique for the entirely synthetic generation of sounds. Born in Munich as the son of the Swiss artist Emil (Rudolf) Pfenninger (1869–1936), Rudolf began studying drawing with his father, and then, after initial experiments with a self-made camera and an apprenticeship as set painter in the Munich Werkstätten für Bühnenkunst Hummelsheim und Romeo in 1914, worked together with Emil Pfenninger as illustrator for Gustav Hegi's multivolume reference work on the flora of central Europe.[8] It was during this period that Pfenninger had his first contact with the movies as a projectionist at various Munich cinemas, an experience that required him to become thoroughly familiar with a wide range of film technologies (optics, mechanics, electronics). In 1921 he was discovered in Munich by the U.S. animator Louis Seel, who hired Pfenninger to draw, paint, and make animated films and text frames for silent films for the *Münchener Bilderbogen*. This was followed in 1925 by a new job in the Kulturfilmabteilung of the EMELKA (after UFA the second-largest film production company of the Weimar era), where he worked on films such as *Zwischen Mars und Erde* (Dir. F. Möhl, 1925). Pfenninger simultaneously pursued intensive engineering research on new radio technologies, in the course of which he developed and patented a number of improvements for loudspeakers, microphones, and so on. It was in the context of this laboratory work that he began his experiments in synthetic sound.

As with Fischinger, there is also an ur-legend surrounding the origin of what Pfenninger called his *tönende Handschrift* (Sounding Handwriting). Unlike Fischinger, however, Pfenninger seems to have been motivated less by synesthesial speculations than by economic necessity. According to the story, the

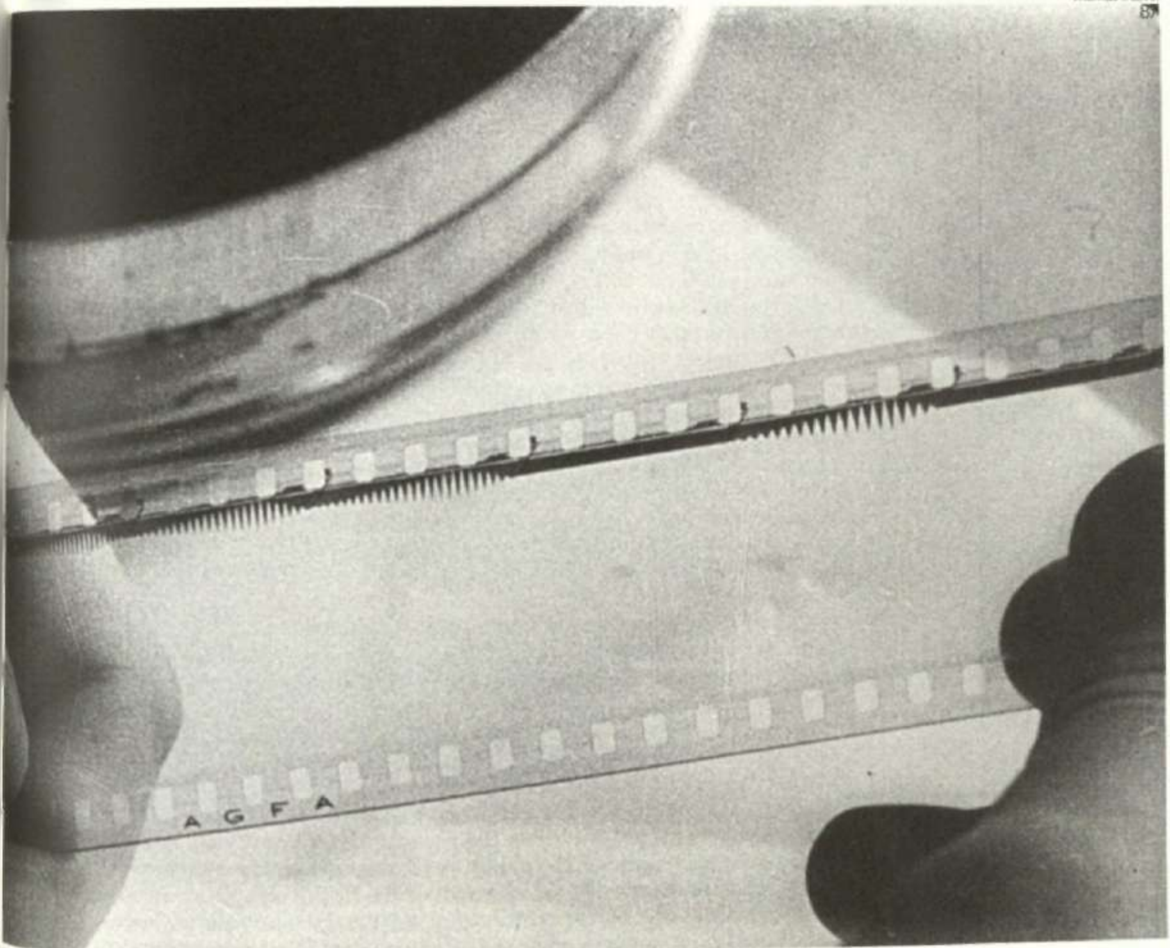
4
This description is from the program note to a screening of Fischinger's »Early Experiments in Hand-Drawn Sound« at The Film Society in London on May 21, 1933. The note is reprinted in *The Film Society Programmes 1925–1939*, New York: Arno Press, 1972, p. 277. Although the program lists the date of these experiments as 1931, entry no. 28 in Moritz, »The Films of Oskar Fischinger,« entitled »Synthetic Sound Experiments,« is described as »several reels of sound experiments from 1932 [that] survive in marginal condition.« On December 10, 1933, the Film Society screened another program of Fischinger films entitled »Experiments in Hand-Drawn Sound,« dated 1933. The 1993 Fischinger filmography in *Optische Poesie* includes only one entry, however, entitled *Tönende Ornamente* (Sounding Ornaments) and described as follows: »Experimente mit gezeichneter Lichttonspur (Experiments with hand-drawn optical soundtrack) s/w, Ton, 123 m, 5 min. (weitere 500 m auf Nitrat erhalten)« (p. 106).

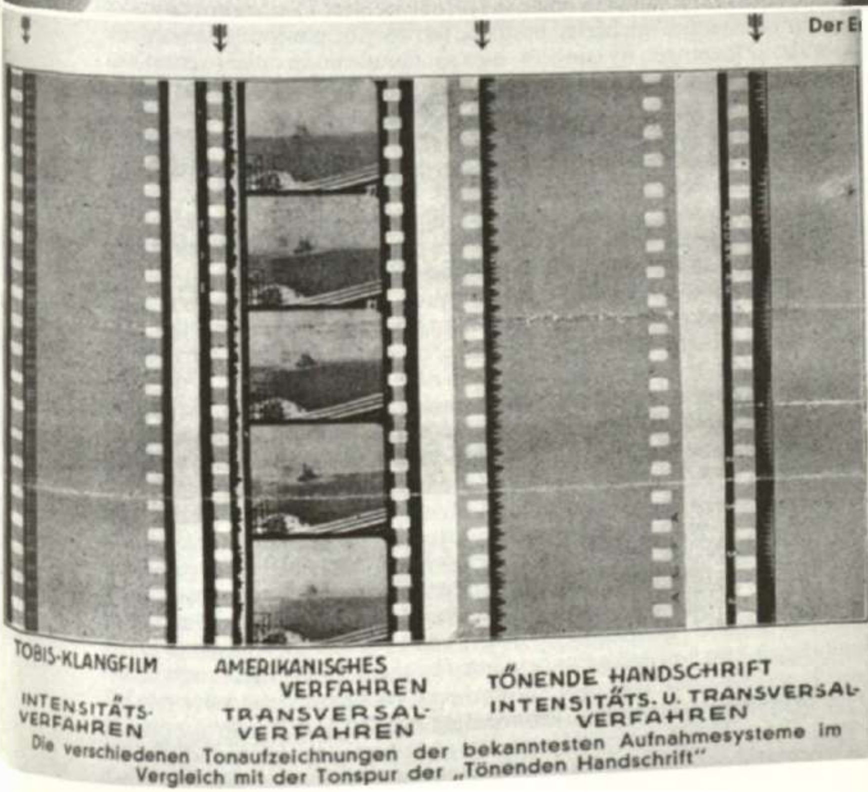
5
Moritz, »The Films of Oskar Fischinger,« p. 51. According to another source, Fischinger made a similar discovery with the geometric motif that the ancient Egyptians used to designate the snake: when reproduced on the optical sound track, the acoustic result was exactly the hiss characteristic of this animal! See Georges Hacquard, *La Musique et le cinema*, Paris: PUF, 1959, p. 34.

6
Oskar Fischinger, »Klingende Ornamente,« *Kraft und Stoff* (suppl. to *Deutsche Allgemeine Zeitung*) 30 (28 July 1932). This edition includes extensive illustrations. The text was reprinted, albeit with occasionally significant variations, as »Tönende Ornamente: Aus Oskar Fischingers neuer Arbeit,« *Filmkurier*, 30 July 1932; and »Klingende Ornamente! Eine neue Basis der Kunst?« *Saarbrücker Landeszeitung*, 11 September 1932. A typescript in the Fischinger Papers in the Iota Foundation Archive (Los Angeles) bears the title »Klingende Ornamente, absoluter Tonfilm« (Sounding Ornaments, Absolute Sound Film), and another textually identical typescript carries the title »Der Komponist der Zukunft und der absolute Tonfilm« (The Composer of the Future and the Absolute Sound Film). Interestingly, the passage cited here is dropped in the *Filmkurier* reprint.

7
Although in his 1974 study Moritz writes that this lecture took place a full year earlier in August 1931 (Moritz, »The Films of Oskar Fischinger,« p. 52), in his 1993 essay on Fischinger the period of both the experiments in drawn sound and the Berlin lecture on the subject is identified as late summer 1932 (Moritz, »Oskar Fischinger,« p. 33). The 1932 dating is also confirmed by the publications of Fischinger's own writings on sounding ornaments – for example, Oskar Fischinger, »Was ich mal sagen möchte,« *Deutsche Allgemeine Zeitung*, 23 July 1932; and the texts cited in note 6 above – as well as the extensive journalistic accounts that only begin to appear in the late summer and fall of 1932. See, for example, Fritz Böhme, »Verborgene Musik im Lindenblatt: Die Bedeutung von Fischingers Entdeckung für den Tonfilm,« *Deutsche Allgemeine Zeitung*, 30 July 1932; M. Epstein, »Elektrische Musik: Neue Wege der Musikaufzeichnung,« *Berliner Tageblatt*, 24 August 1932; Margot Epstein, »Gezeichnete Musik: Oskar Fischingers ›Tönende Ornamente,‹« *Allgemeine Musikzeitung*, 25 November 1932, 591; and Fritz Böhme, »Gezeichnete Musik: Betrachtungen zur Entdeckung Oskar Fischingers,« *Deutsche Frauen-Kultur* 2 (February 1933): 31–33. The confusion as to the year might be due to Fischinger's highly proprietary relationship to this subject matter and his desire to show that his experiments had preceded Pfenninger's (which were also first made public in the summer of 1932) — an imperative that often led to postfactum redating of works.

8
Gustav Hegi, *Illustrierte Flora von Mittel-Europa*, Munich: J.F. Lehmann, 1906–1931.





↑
Film still from *Tönende Handschrift – das Wunder des gezeichneten Tones*, 1931 (Filmmuseum, Munich). / Filmstill aus *Tönende Handschrift – das Wunder des gezeichneten Tones*, 1931 (Filmmuseum München).

←
Examples of different optical sound systems; film still from *Tönende Handschrift – das Wunder des gezeichneten Tones*, 1931 (Filmmuseum, Munich). / Beispiele verschiedener optischer Tonsysterne; Filmsstill aus *Tönende Handschrift – das Wunder des gezeichneten Tones*, 1931 (Filmmuseum München).

poorly paid inventor Pfenninger was eager to provide a sound track for the experimental animations he was making on the side, but he could afford neither the musicians nor the studio to record them.[9] Instead, he sat down with an oscilloscope and studied the visual patterns produced by specific sounds until he was able — sometime in late 1929 or early 1930[10] — to isolate a unique graphic signature for each tone. Using the newly available optical film soundtrack to test his experimental results, he would painstakingly draw the desired curve onto a strip of paper which he then photographed in order to integrate it into the optical sound track. The resulting sound, phenomenalized by the selenium cell, was one that had never been previously recorded but was, in effect, written by hand: »hand-drawn sound,« as Pfenninger called it. And indeed, the first films that Pfenninger made for EMELKA in late 1930 with an entirely synthetic sound track — an extremely labor-intensive task that involved choosing and then photographing the right paper strip of sound curves for each note — were his own undersea animation, *Pitsch und Patsch*, and a »groteskes Ballett« film directed by Heinrich Köhler and entitled *Kleine Rebellion*.

When the discovery of the »Tönende Handschrift« was first presented to journalists in a special demonstration at the Kulturlfilmabteilung of the EMELKA studios in the late spring of 1931, the numerous published accounts compared Pfenninger's breakthrough not with work by Fischinger but, instead, with the recent news of the comparable technical achievement in England by the engineer Humphries. Odo S. Matz, for example, who claims to have been one of the first to hear the results of Pfenninger's new technique, once again opens up the question of historical priority (here laced with an added dimension of national chauvinism) when he points out in his report that Pfenninger was working on his project *before* the news of Humphries's work splashed across newspapers around the world. As if this was not enough, however, Matz goes on to dismiss the achievement of the British competitor as facile techno-mimesis (why bother synthesizing the human voice when any microphone could do it better?), while the »true« pioneer Pfenninger was exploring the much more uncharted aesthetic territory of previously unheard *new* sounds: »Pfenninger, by contrast, uses similar means in order to create new sonic effects which are unknown to our ears because they cannot be generated by any instrument. Herein lies the magical quality of this invention.«[11] Indeed, it may well have been the news of Pfenninger's discovery that led Fischinger to suddenly begin to explore a generative rather than simply analogic logic between graphic form and musical sounds: how else to account for the fact that, as Moritz reports,« he interrupted his work on his other projects including *Studie Nr. 11* in order to produce hundreds of test images which he then recorded as images for the soundtrack.«[12]

Having tantalized the public through the press accounts in 1931, very possibly so as not to be eclipsed by the stories about Humphries, EMELKA then waited over a year before announcing the first full-scale public demonstrations of Pfenninger's pioneering achievement in a multicity gala launching of a series of films with entirely synthetic sound tracks. *Die tönende Handschrift: Eine Serie gezeichneter Tonfilme eingeleitet durch ein Film-Interview* (Sounding Handwriting: A Series of Hand-Drawn Sound Films introduced by a Filmed Interview) premiered at the Munich Kammerlichtspiele on October 19, 1932, and the following day at an invitation-only matinee in the grand Marmorhaus cinema-palace in Berlin, an event also attended by Pfenninger, who personally thanked the audience for, as the *Film-Kurier* described it, »its justifiably amazed and enthusiastic response to the screening.«[13] The program — which EMELKA circulated to cinemas throughout Europe in late 1932 under the title *Die tönende Handschrift*[14] — consisted of *Kleine Rebellion* and *Pitsch und Patsch*, two »groteske Puppenfilme« by the brothers Diehl entitled *Barcarole* and *Serenade*, and a »Naturfilm« entitled *Largo*. These were preceded by a fascinating pedagogical documentary entitled *Das Wunder des gezeichneten Tones* (The Wonder of Hand-Drawn Sound) (which was also released as a newsreel announcing the new discovery) and consisting of an illustrated

9
Pfenninger's early animations include *Largo* (1922), *Aus dem Leben eines Hemdes* (1926), *Sonnenersatz* (1926), and *Tintenbuben* (1929). For the history of the studio, see Petra Putz, *Waterloo in Geiselgasteig: Die Geschichte des Münchner Filmkonzerns Emelka (1919–1933) im Antagonismus zwischen Bayern und dem Reich*, Trier, Germany: WVT, 1996.

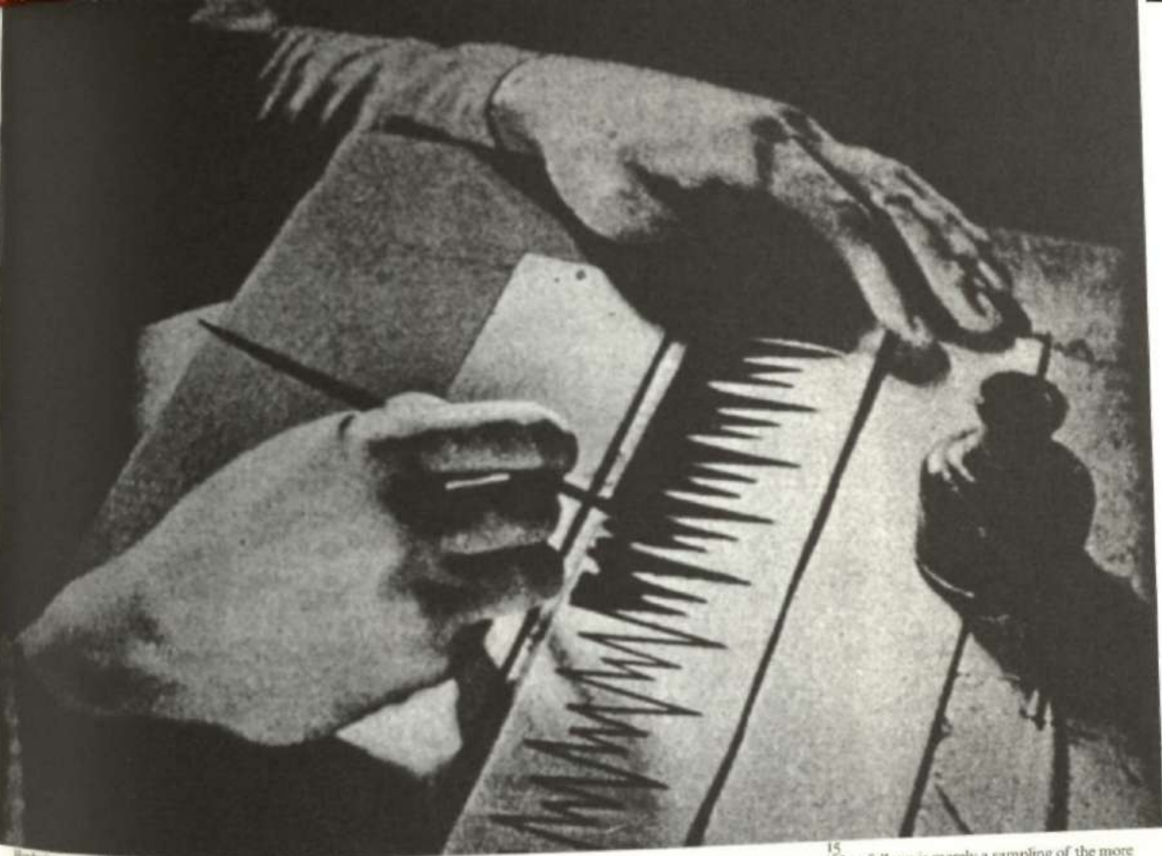
10
Given how long Pfenninger would have needed to translate his initial insight into the functioning system with which he would complete his first synthetic soundtrack in 1930, it seems reasonable to assume, as numerous music and media historians have done, that Pfenninger's discovery of synthetic sound effectively took place »perhaps as early as 1929.« (Hugh Davies, »Drawn Sound,« in *New Grove Dictionary of Musical Instruments* 1, p. 596–597). The 1929 date is also invoked by Peter Weibel, who states that »Rudolf Pfenninger invented ›sounding handwriting‹ in 1929 in Munich by taking sounds drawn onto paper strips and shooting them one by one directly with the camera, thereby incorporating them into the optical soundtrack.« (Weibel, »Von der visuellen Musik zum Musikvideo,« in *Clip, Klapp, Bum: Von der visuellen Musik zum Musikvideo*, ed. Veruschka Body and Peter Weibel, Cologne: Dumont, 1987, p. 84.)

11
Odo S. Matz, »Die tönende Handschrift,« *Prager Deutsche Zeitung*, May 1931; reprinted in *Wahrisches Tageblatt*, 21 July 1931. See also »Töne aus dem Nichts: Die phantastische Erfindung eines Müncheners,« *Telegrammzeitung*, September 1931; and »Töne aus dem Nichts: Eine Erfindung Rudolf Pfenningers,« *Acht Uhr Abendblatt* (Berlin), 12 October 1931. The latter report clearly has taken Humphries's achievement as the obvious litmus test for Pfenninger's innovation when it insists that »the inventor is currently working on drawing from out of nowhere the sound curves of the human voice using a paint brush and drafting pen, based on precise physical experiments.« Matz's nationalistic casting of Pfenninger's discovery is, moreover, by no means exceptional: under a widely reproduced photo of the inventor working with strips of sound waves in his studio, the *Bayerische Zeitung* of October 31, 1932, has a caption that reads, »Gemalter Tonfilm – eine bedeutsame *deutsche* Erfindung« (Painted Sound Film – A Significant *German* Invention); emphasis added.

12
Moritz, »Oskar Fischinger,« 31. Moritz's account goes on to describe how »through the study of extant soundtracks he quickly mastered the calligraphy of traditional European music such that he was able to record ›Fox you have stolen the goose‹ and other simple melodies.« In the context, this plausible but otherwise undocumented claim to have also mastered a technique that is clearly similar if not identical to Pfenninger's systematic procedure is most likely wishful apocrypha.

13
»Tonfilm ohne Tonaufnahme: Die Sensation der tönenden Schrift,« *Film-Kurier*, 20 October 1932.

14
I have been able to track down reviews and/or announcements of screenings of some or all of the *Tönende Handschrift* series at the Capitol in Berlin; the Phoebus Lichtspiele and the University in Munich; the Capitol-Lichtspiele in Halberstadt; the Emelka-Theater in Münster; the Goethehaus, Imperator, and Universum-Lichtspiele in Hannover; the Kristall-Palast in Liegnitz; and the Brussels Filmweek. The film's distribution in Holland is confirmed by the existence of a print with Dutch text frames in the collection of the Nederlands Filmmuseum in Amsterdam.



Handwritten sound; film still from *Tönende Handschrift – das Wunder des gezeichneten Tones*, 1931 (Filmmuseum, Munich). / Handgezeichneter Ton; Filmstill aus *Tönende Handschrift – das Wunder des gezeichneten Tones*, 1931 (Filmmuseum München). ↑

history of sound recording followed by an on-camera interview of Pfenninger by the charismatic film personality Helmuth Renar. The journalistic response was, as one might expect, both extensive and largely enthusiastic.[15] Although generally fascinated by the technical achievement and its promise, most critics were perplexed and even annoyed by the new sounds: while some were entranced by what they felt was »very beautiful ›mechanical‹ music, a sort of carousel music,« others wrote of its »primitive and somewhat nasal timbre,« how it gave an »impression of being mechanical, almost soul-less,« and that it had »a snore-like quality and (since the tones belong primarily to the realm of the flutes and plucking instruments), a monotone quality as well.«[16] As one reviewer put it, »the sound reminds one of stopped organ pipes, muted horns, harps, xylophones. It sounds strangely unreal.«[17]

15
What follows is merely a sampling of the more detailed reviews in the major European papers and film journals, leaving aside the vast number of reprints, local reviews of the various screenings, radio programs, interviews, academic lectures, and other public events promoting Pfenninger's work in the months that followed: Jury Rony, »Tonfilm ohne Tonaufnahmen,« *Pressedienst der Bayerischen Film-Ges.m.b.H.* 13 (19 October 1932); Karl Kroll, »Musik aus Tinte,« *Münchener Zeitung*, 19 October 1932; St., »Die tönende Handschrift,« *Deutsche Filmzeitung* 43 (21 October 1932); *Zz.*, »Tönende Handschrift,« *Germania*, 21 October 1932; »Handgezeichnete Musik,« *Vossische Zeitung*, 21 October 1932; »Tönende Handschrift,« *Kinematograph* (Berlin), 21 October 1932; -n., »Die tönende Handschrift: Sondervorführung im Marmorhaus,« *Film-Kurier*, 21 October 1932; »Pfenningers ›tönende Handschrift‹ im Marmorhaus,« *Lichtbild-Bühne*, 21 October 1932; wkl, »Von Ruttmann bis Pfenninger: Zu der Sondervorführung in den Kammerlichtspielen,« *Münchener Zeitung*, 22 October 1932; Dr. London, »Pfennigers [sic] ›tönende Handschrift,‹« *Der Film*, 22 October 1932; -au-, »Gezeichnete Töne: Neue Wege für den Tonfilm,« *Berliner Morgenpost*, 23 October 1932; -e., »Tönende Handschrift: Sondervorstellung im Marmorhaus,« *Deutsche allgemeine Zeitung* (Beiblatt), 23 October 1932; W.P., »Der gezeichnete Tonfilm,« *Frankfurter Zeitung*, 2 November 1932; »Erschließung einer unbekannten Welt: Gezeichnete Musik,« *Tempo* (Berlin), 2 November 1932; and K.L., »Die tönende Handschrift,« *Neue Zürcher Zeitung*, 27 November 1932.

16
N., »Klänge aus dem Nichts: Rudolf Henningers [sic] ›Tönende Handschrift,‹« *Film-Journal* (Berlin), 23 October 1932; K[urt] Pfister, »Die tönende Handschrift,« *Breslauer Neueste Nachrichten*, 24 October 1932; -au-, »Gezeichnete Töne«; A. Huth, »Die tönende Handschrift: Eine sensationelle Erfindung,« *Nordhäuser Zeitung u. Generalanzeiger*, n.d.

17
K. Wolter, »Gezeichnete Tonfilmmusik,« *Filmtechnik*, 12 November 1932, 12–13. Not surprisingly, the reaction to Fischinger's experiments was much the same. According to Moritz's account, »When Fischinger picked up the first reels of *Sounding Ornaments* from the lab and had them screened there on the lab's projectors, the technicians were shocked by the strange sounds and feared that further reels with this noise could ruin their machines.« (Moritz, »Oskar Fischinger,« p. 33).

In lieu of a more detailed account of the fascinating reception history, consider the following representative account by R. Prévot published the day after the premiere in the *Münchener Neueste Nachrichten:*

> What we saw yesterday morning was more than simply initial experiments. Our technological sense was fascinated, our imagination of the future provoked! […] At the same time, I must admit that our music-loving ear did go on strike, and our lively artistic consciousness was troubled.
>
> Was this still music? […] rarely have we felt so clearly the inner difference between live art and technological construct. One heard piano and xylophone — like sounds, others which seemed to come out of a steam whistle — all of them crafted together with great precision, much as if someone were to build a tree out of a thousand pieces of wood, which can look deceptively real and yet will never bloom! […] Without a doubt, this abstract, this skeletal music fit best with the animated images—here there was a sort of technical unison. But the attempt to »give life« by such musical means to the dance and mimicry of live people seemed utterly impossible. The effect was like that of a dance of the dead! Here we must give voice to a decided »halt!«
>
> […] Film has finally succeeded in creating a new »technological art« which has its own essence distinct from that of live theater. Perhaps the Pfenninger method will also succeed in finding tones and tonal complexes which are new and cannot be produced by natural means; i.e., a music which does not yet exist — a real music of the future? Let us hope that it turns out to be beautiful![18]

Prévot's response is typical in its combination of techno-fetishistic fascination, its concern with the question of aesthetically »appropriate« sound-image combinations, and above all in the way it registers the instinctive threat to a longstanding, supposedly a-technological conception of music. Many critics insisted that Pfenninger's invention ought to be measured against other new electronic musical instruments or technologies of the time, such as the Theremin or the Trautonium, in that, like them, its future lay in the exploitation of its capacity to make »new« sounds, not in imitating extant ones, the latter being both redundant and economically ill-advised. But this seemingly progressive openness to an unknown acoustic futurity was of course itself also a way of displacing the threat posed to the organic notion of the acoustic by synthetic sound — a tree made of wood but that can never bloom!: »*Unheimlich,*« writes the critic of the *Frankfurter Zeitung*, »the degree to which technology unceasingly renders superfluous in all domains both organic creation and the natural labors of man!«[19] Nowhere is this clearer than in the simultaneous amazement and horror in response to the prospect — possibly envisioned by Pfenninger but (as far as I know) never realized — of outdoing Humphries by making a full-length »talkie« with entirely synthetic voices, a film in which, as one critic put it, »words will be spoken which belong to no person!«[20] Even critics willing to admit that all instrumental music was, as such, necessarily mechanical, had always insisted that the voice remained the residuum of the extra-technological: »Actually all music is mechanical, with the sole exception of human singing. For all music is made with machines — only the larynx is organic.«[21] Pfenninger's technique effectively meant that — at least in theory — this long-standing claim was simply no longer valid.

Following the Pfenninger premieres in late 1932, comparisons with Fischinger's work first begin to appear in print. While a few journalistic accounts are content merely to note the seeming similarity of the two projects, most cast the Fischinger-Pfenninger juxtaposition in terms — *basic impulse* versus *logical conclusion, decorative* versus *analytic* — that imply that it was a question not of who was the first to »discover« synthetic sound but rather of two related but, in the last analysis, very different projects.[22] This is the sense conveyed in the roundup of German cinema for the year 1933 published by Andor Kraszna-Krausz in *Close-Up:*

> two Germans who work on films have announced that they want to transpose phonetically with the photo cell the light reactions of plastics, and to

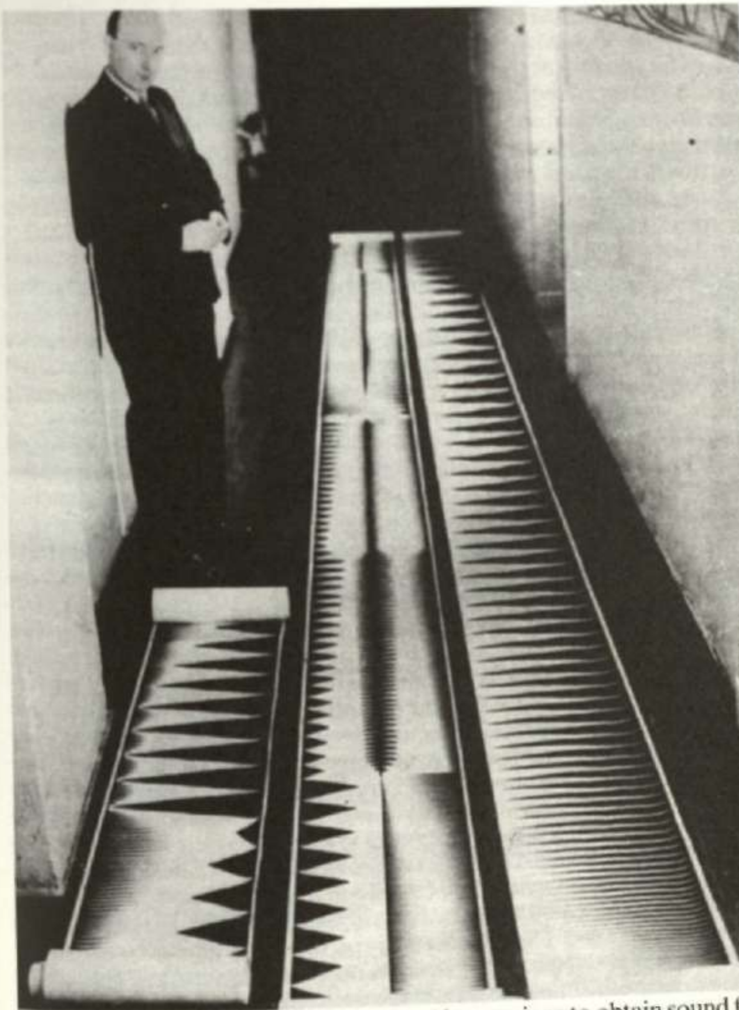
18
R. Prévot, »Musik aus dem Nichts: Rudolf Pfenningers ›Tönende Handschrift,‹« *Münchener Neueste Nachrichten*, 20 October 1932; emphasis in original.

19
W.P., »Der gezeichnete Tonfilm.«

20
wbf, »Handgezeichnete Musik,« *Telegramm-Zeitung*, 19 October 1932.

21
Paul Bernhard, »Mechanik und Organik,« *Der Auftakt* 10, no. 11 (1930): 239.

22
See, for example, Kroll, »Musik aus Tinte«; wkl, »Von Ruttmann bis Pfenninger«; and »›Tönende Handschrift‹: Neuartige Wirkungsmöglichkeiten des Tonfilms,« *Kölnische Zeitung*, 25 October 1932.



Oskar Fischinger with rolls representing synthetic sound; press photograph, 1932. / Oskar Fischinger mit Rollen synthetischen Tons; Pressefoto, 1932.

compose them with their parallel visual impressions to obtain sound film accords.

This extremity must have been suggested by the experiments of Oscar Fischinger whose compositions of dancing lines are the only kind of abstract film which can be found in the regular programme of the German cinemas, and which are well received by the public. Fischinger, who originally by synchronisation of his studies made real record pieces, has been trying recently — in order to obtain a more complete unity of picture and sound — to record decorative music in the *Lichtongerät* (light-sound) apparatus.

Simpler, more thorough and practical seem to be the similar endeavours of Rudolf Pfenniger [*sic*], who after a long and difficult analysis, was successful in the calculation of sound writings, and also in drawing them with the hand.[23]

And indeed, upon closer examination of the manner in which each of these inventors *frames* his activities, it becomes clear that despite the superficial similarity they are each pursuing very different goals. Fischinger, as he himself is the first to admit, is basically interested in exploring the relationship between given graphic forms and their acoustic correlates, and how that isomorphism might allow one to make cultural-physiogonomic comparisons. When, for example, he suggests that »we should investigate the ornaments of primitive tribes in terms of their tonal character«[24] it is clear that his point of

23
A[ndor] Kraszna-Krausz, »Beginning of the Year in Germany,« *Close-Up* 10 (March 1933): 74–76. The comparison is cast in somewhat different terms – artistic versus commercial – in the program notes for a May 21, 1933, screening of Fischinger's »Early Experiments in Hand-Drawn Sound« at the Film Society in London. In this text, which likely was either written by Fischinger or based on materials he provided, the audience is advised that what they are about to see is »not to be confused with the similar effects invented by Hans [sic] Pfenninger. The latter system has been developed commercially to form the musical accompaniment to puppet and cartoon films.« *The Film Society Programmes 1925–1939*, p. 277.

24
This phrase from a typescript of Fischinger's 1932 essay »Klingende Ornamente« in the Fischinger Papers in the Iota Foundation Archive, does not appear in any of the published versions I have found.

departure is the graphic mark. Besides this sociological interest, Fischinger also repeatedly argues that hand-drawn sound restores an artistic »sovereignty« to the filmmaker by once again giving him control over elements that the studio system had delegated to specialists. Invoking a rather hackneyed topos from romantic aesthetics, Fischinger insists that »real« art cannot tolerate such collective production because

> this in the truest sense most refined and highest artistic activity comes to be only through, and directly out of, a singular personality, and the artwork that arises in this manner — for example works by Rembrandt, Bach or Michelangelo — are immediate creations of the highest power and profit *precisely from their handwritten*, irrational and personal qualities.[25]

Despite the fact that, in what might well be an amusing tip of the hat to Pfenninger, the article from which this passage is taken is signed »Engineer Oskar Fischinger,« it is clear that for Fischinger handwritten sound, indeed writing per se, is entirely in the service of a thoroughly anti-technological (irrational) artistic intention: »hand-made film renders possible pure artistic creation.«[26] Nothing could be further from the impulse behind engineer Pfenninger's fundamentally pragmatic and sober scientific investigations. Eschewing aesthetic discourse entirely, Pfenninger focused on the technological development of a new form of acoustic writing, a semio-pragmatics of sound whose function was to liberate composition from the constraints of both the extant musical instrumentarium and reigning notational conventions. Unlike Fischinger, who began with graphic forms and then explored what sort of sounds they produced, Pfenninger's primary focus was on the acoustic, in an attempt to establish what the precise wave form is that would allow one to re-produce a specific sound at will. Despite the potential visual appeal of their sine-wave forms, Pfenninger's curves are decidedly *not* ornaments but are rather, as numerous critics have rightly noted, »templates or print-types«[27]; that is, semiotic entities that can be combined to produce sounds in a linguistic — which is to say, thoroughly technical and rule-governed — manner. Unlike Fischinger's curves, which were continuous, Pfenninger's were discrete units. Indeed, in what is perhaps the most succinct manner of differentiating the two projects, while Pfenninger could (at least in theory) have used his method to re-produce every sound made by Fischinger's ornaments, the opposite is obviously not the case. Thus it is no surprise that from the start critics rightly insisted that Pfenninger's invention was not an ornamental practice as much as it was a new technique of acoustic notation, even going so far as to claim that he was in the process of »constructing a contrivance resembling a typewriter which, instead of letters, will set together sign waves in succession.«[28] Pfenninger's discovery was threatening not only because it challenged the hegemony of certain tonal systems (since graphic sound is both entirely free of overtones and entirely compatible with quarter-tone and other scale systems), but also because it represented a fundamental shift in the *status* of recorded sound. As pointed out most clearly in an anonymous review in the *Völkischer Beobachter* [*sic*], prior to Pfenninger, all recorded sound was always a recording *of* something — a voice, an instrument, a chance sound: »in this system, something audible can be recorded by the microphone only if it really exists; i.e., if it was produced somewhere *beforehand*. Rudolf Pfenninger, however, produces tones from out of nowhere.«[29] If Pfenninger's synthetic generation of sound effectively *destroyed the logic of acoustic indexicality* that was the basis of all prior recorded sound, it also exposed the *residual iconic-indexicality* in Fischinger's only seemingly similar activities. Indeed, the experimental fascination with establishing the acoustic correlates *of* a profile or *of* a particular visual form at some level always also assumes that such sounds are sounds *of* something, even if that something is now simply a recognizable graphic trace. Thus, to the extent that Fischinger's work explores and uses the sounds made by various extant things (in his case, graphic forms), his work could be described as a sort of proleptic *musique concrète*, while Pfenninger's synthetic practice is closer to certain nonreferential, acous-

25
Ingenieur Oskar Fischinger, »Der absolute Tonfilm,« *Dortmunder Zeitung* (1 January 1933); emphasis added. Reprinted as »Der absolute Tonfilm: Neue Möglichkeiten für den bildenden Künstler,« *Der Mittag* (Düsseldorf), January 1933; also in *Schwäbischer Merkur*, 23 January 1933. A typescript of this article in the Iota Foundation Archive with the title »Der Komponist der Zukunft und der absolute Film« bears a handwritten date of 1931–1932, which might well be an example of the retro-dating mentioned earlier.

26
Fischinger's fundamentally antitechnological stance is articulated unambiguously in an essay that explains hand-drawn music as part of his project of »absolute film,« which it defines as »a film that only embraces technology to the extent that it really serves to realize artistic creations. It is thus a redemption of art and of the artistic personality in the context of film production.« (see Böhme, »Gezeichnete Musik.«)

27
Max Lenz, »Der gezeichnete Tonfilm,« *Die Umschau* 36, no. 49 (3 December 1932): 971–973.

28
»Soundless Film Recording,« *New York Times*, 29 January 1933, sec. 9, 6. As far as I can tell, no such device was ever constructed.

29
»Tönende Handschrift,« *Völkischer Beobachter*, 25 October 1932; emphasis added.

tically constitutive practices of electronic music. To the extent that Fischinger's ornaments function semiotically, they do so as »motivated« signs, whereas Pfenninger's curves depend, strictly speaking, on only the particular — and in the last analysis, arbitrary — properties of the selenium cell that is the basis of the particular optical cinema sound system he used to produce his sonic graphematics. And it is this crucial semiotic difference that ultimately explains why Paul Seligmann, a member of *Das neue Frankfurt* film club for whom Laszlo Moholy-Nagy had screened works by both Fischinger and Pfenninger, credits only Pfenninger and not Fischinger with the invention of a functional system of acoustic writing: »It is in the end Pfenninger who discovered the path to acoustic writing. While Fischinger merely photographs sound as a process, Pfenninger captures it as individual images, which led him to develop templates by means of which particular sounds and sound groups can be repeated at will.«[30] Indeed, in its rigorously systematic character, Pfenninger's research deserves to be compared closely not with Fischinger but rather with the very similar — and similarly analytic — investigations into synthetic sound undertaken at the same time in the Soviet Union by Nikolai Voinov and Aleksandr Ivanov, who cut out saw-toothed sound shapes from paper in the form of contoured combs, each representing a halftone, which could then be used repeatedly and in various combinations much like the basic formal vocabulary of visual animation; and by Evgenii Sholpo, who developed a very successful circular »disc« variation on Voinov and Ivanov's combs.[31]

30
Paul Seligmann, »Filmsituation 1933« in: Hirdina, ed., *Neues Bauen/Neues Gestalten*: 341; first published in *Die neue Stadt* (1932–1933), no. 10. Echoing Seligmann's conclusion, the intelligent critic of the *Münchener Zeitung* also recognized that Pfenninger's project is fundamentally different from those of his predecessors and that the credit for the invention of synthetic sound »thus belongs entirely and exclusively to him«. His argument however – »Rudolf Pfenninger's ›sounding handwriting‹ *creates* sounds from out of nowhere whereas Walter Ruttmann's, Moholy-Nagy's and Oskar Fischinger's film studies *arise out of* the music or a musical-rhythmic experience« (emphasis added) – gets the different directions of the creative vectors exactly wrong: however musical the inspiration for their genesis might have been, Fischinger's curves are not *derived* from sound; they generate it, whereas Pfenninger's curves *are* in the last analysis derived *from* the sounds that they analytically recreate. (Wkl, »Von Ruttmann bis Pfenninger.«)

31
An intelligent, illustrated, contemporary account in English can be found in Waldemar Kaempffert, »The Week in Science,« *New York Times*, 11 August 1935, sec. 10, 6.

Der Wettlauf, der keiner war: Fischinger, Pfenninger und die »Entdeckung« des synthetischen Tons*

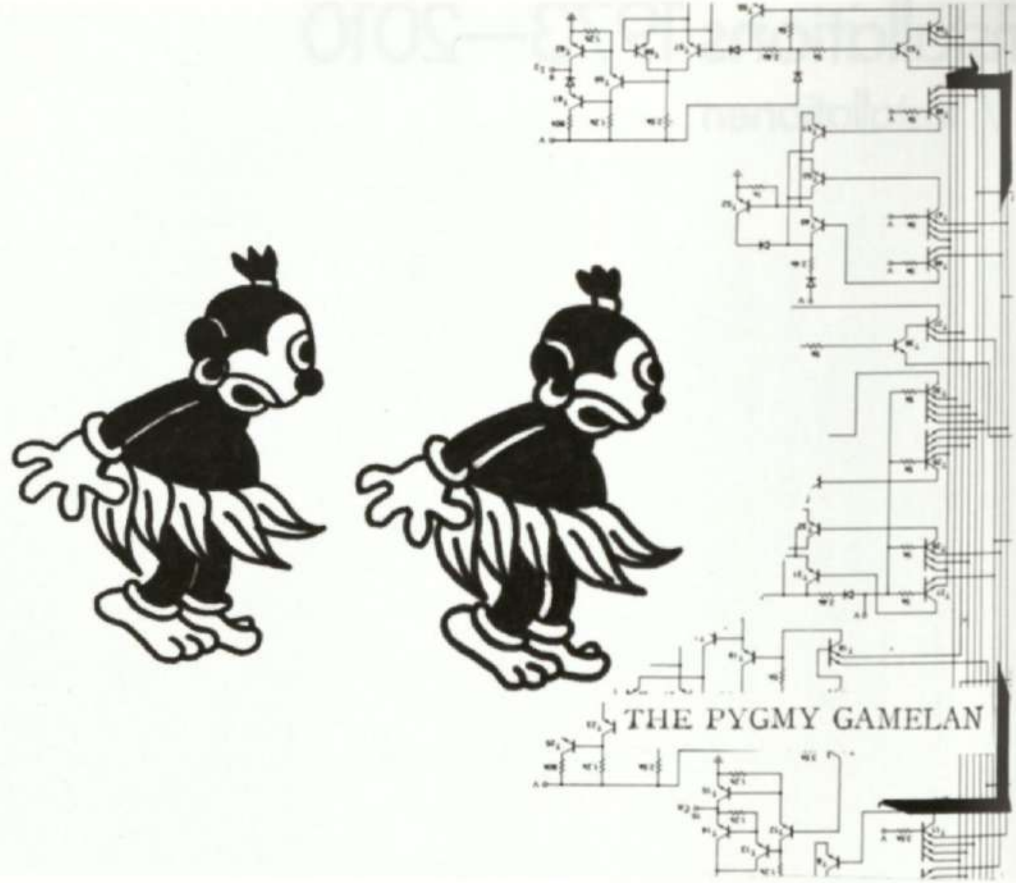
Thomas Y. Levin

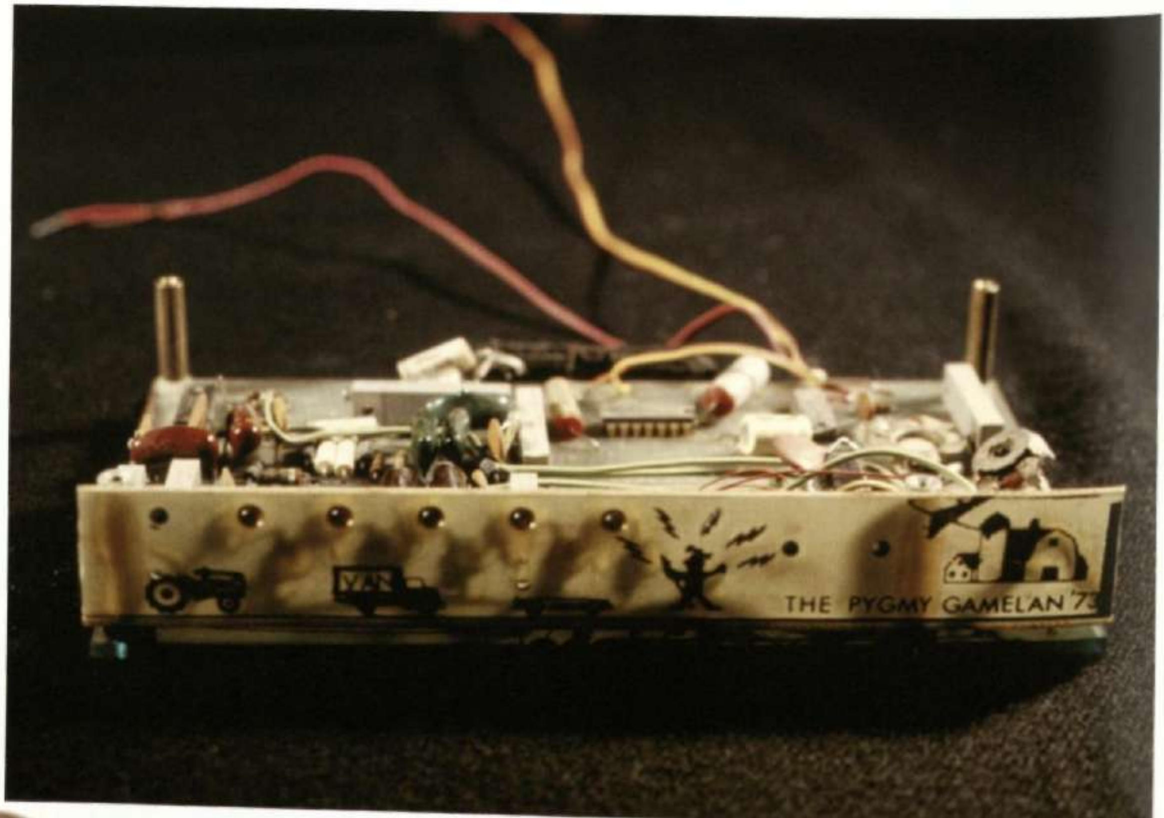
In einem klassischen Fall von merkwürdiger Gleichzeitigkeit, die in der Geschichte ein sich immer wiederholendes Kennzeichen für die Überdeterminierung ist, welche die Geschichte der Erfindungen prägt, arbeitete eine Anzahl von Leuten während der frühen dreißiger Jahre in verschiedenen Ländern der Welt fieberhaft (aber unabhängig) an Forschungen über etwas, das sie jeweils als »hand-gezeichneten«, »animierten«, »ornamentalen« und/oder »synthetischen Klang« bezeichneten. Neben dem Physiker Humphries in England gab es in der Sowjetunion nach verschiedenen Berichten nicht weniger als drei unterschiedliche Gruppen von Forschern, die in Leningrad und Moskau am handgezeichneten Ton arbeiteten: In ihren Reihen standen Persönlichkeiten wie der Komponist, Musiktheoretiker und Performance-Anstifter Arsenii Avraamov, der Maler, Buchillustrator und Trickfilmzeichner Mikhail Tsekhanovskii, der Ingenieur Evgenii Sholpo, die Trickfilmzeichner Nikolai Voinov und Nikolai Zhilinski und der Erfinder Boris Yankovskii. Obwohl aus Platzgründen hier nur eine oberflächliche Betrachtung dieser entscheidenden sowjetischen Entwicklungen möglich ist (auf sie wird an anderer Stelle detaillierter eingegangen), darf man nicht außer acht lassen, dass diese Gruppen einige extrem wichtige theoretische und praktische Ergebnisse produzierten, nicht zuletzt die Entwicklung eines Proto-Synthesizers namens »Variofon«, und eines zweiten namens »Vibro-Eksponator«.[1] Zu genau der gleichen Zeit und, soweit ich weiß, ohne Kenntnis von den Vorgängen in der UdSSR, arbeitete man auch in Deutschland, nämlich Pfenninger in München und ein wenig später Fischinger in Berlin, an ähnlichen Projekten mit ähnlichen Zielsetzungen.

*
Dieser Essay ist ein Kapitel aus einer zuerst auf Deutsch erschienen ausführlichen Studie mit dem Titel »Töne aus dem Nichts«. Rudolf Pfenninger und die Archäologie des synthetischen Tons«, in: Friedrich Kittler, Thomas Macho und Sigrid Weigel, Hrsg., *Zwischen Rauschen und Offenbarung: Zur Kultur- und Mediengeschichte der Stimme*, Berlin: Akademie Verlag, 2002, S. 313–355. Auf Englisch erschien sie unter dem Titel »Tones from out of Nowhere: Rudolf Pfenninger and the Archaeology of Synthetic Sound« in: *Grey Room* 12 (Fall 2003), S. 32–79.

1
Einer der wenigen auf Englisch vorliegenden Texte über dieses faszinierende und größtenteils unbekannte Thema ist Nikolai Izvolovs »The History of Drawn Sound in Soviet Russia«, trans. James Mann, *Animation Journal* 7 (Spring 1998), S. 54–59. Vgl. auch die Einträge von Hugh Davies über »Avraamov, Arseny Mikhaylovich« im *New Grove Dictionary of Musical Instruments* 1, ed. Stanley Sadie, London: Macmillan Press 1984, S. 91; über »Sholpo, Evgeny Aleksandrovich« im *New Grove Dictionary of Musical Instruments* 3, S. 377 und das »Variaphon [sic]« im *New Grove Dictionary of Musical Instruments* 3, S. 716. Zu Humphries vgl. »Synthetic Speech Demonstrated in London: Engineer Creates Voice Which Never Existed«, *New York Times*, 16 February 1931, S. 2.

Installations 1973—2010
/ Installationen


THE PYGMY GAMELAN


THE PYGMY GAMELAN '73

The Pygmy Gamelan

Electronic circuit composition / Installation **1973**

Five to ten little electronic circuits respond to electrical fluctuations in the galaxy by improvising around five-note musical phrases. Fünf bis zehn kleine elektronische Schaltkreise reagieren mit fünftönigen musikalischen Phrasen auf elektrische Feldschwankungen.

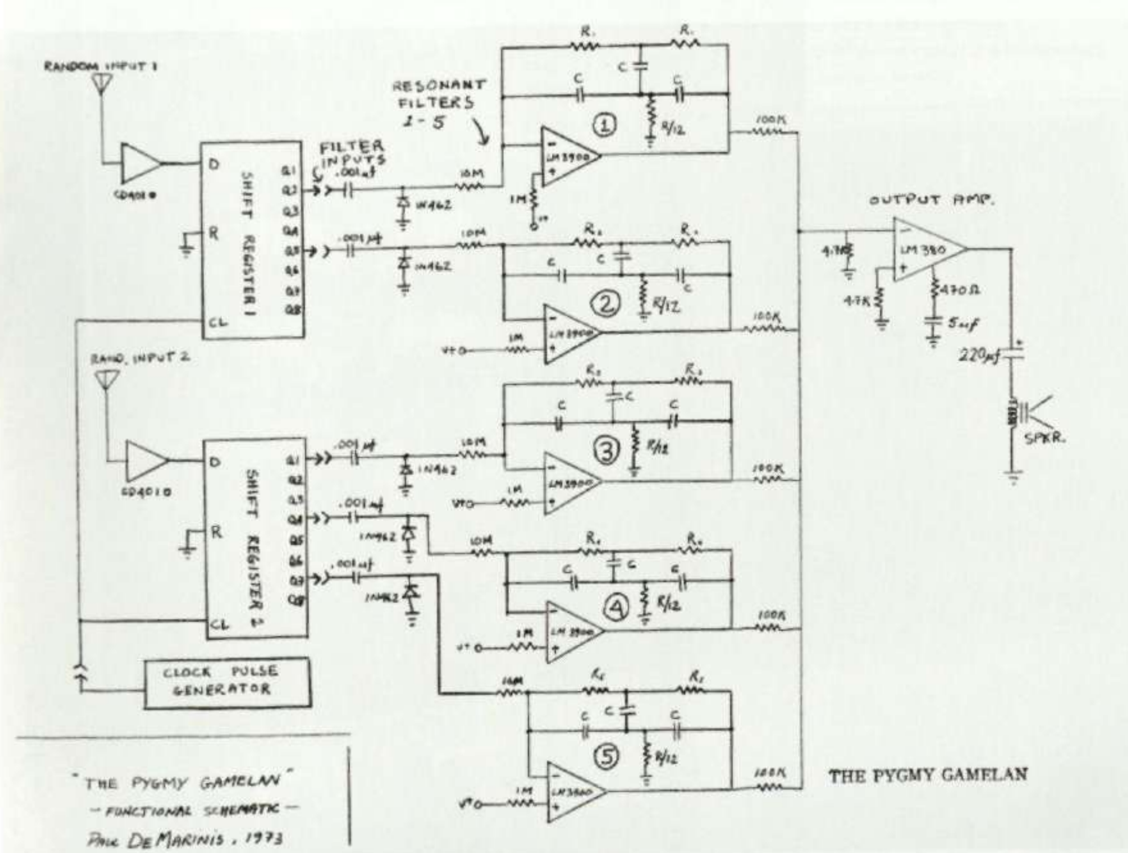
The Pygmy Gamelan is an installation piece for small electronic circuits in a quiet space. Each Pygmy Gamelan module is a box measuring 4×7×1 inches, which responds to fluctuating electrical fields (generated by people moving around, radio transmissions, the births of distant stars and galaxies) by changing the patterns of five-note melodies it plays. The integrated circuits used in *The Pygmy Gamelan* are all inexpensive surplus items originally intended for consumer products. Their use here, however, is purely folkloric and tends, like the hand carved plastic artifacts which must circulate in primitive societies, to refer to a culture other than that of high technology.

The Pygmy Gamelan ist eine Installation für kleine elektronische Schaltkreise in einem stillen Raum. Jedes Modul besteht aus einer 4×7×1 Zoll großen Box, die auf elektrische Feldschwankungen (ausgelöst durch herumgehende Menschen, Funkwellen oder die Geburt neuer Sterne und Galaxien) mit Veränderungen der von ihnen gespielten Fünfton-Melodien reagiert. Die integrierten Schaltungen im *Pygmy Gamelan* sind lauter preisgünstige, ursprünglich für Konsumartikel vorgesehene Überschussprodukte. Ihre Verwendung ist rein folkloristischer Natur und verweist wie die manuell bearbeiteten Plastikartefakte, die in primitiven Gesellschaften zirkulieren, auf eine Kultur jenseits der Hochtechnologie.

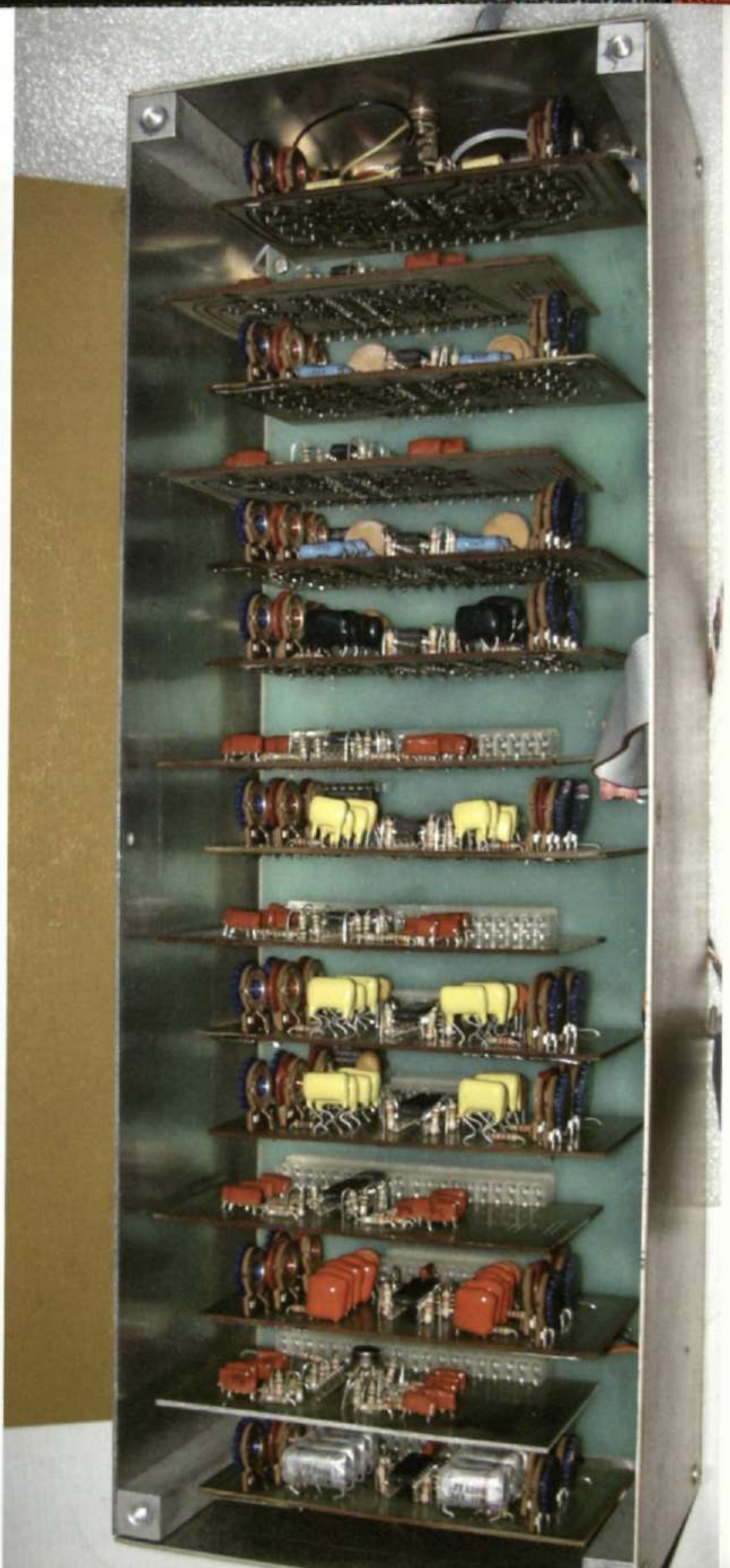
Exhibited at:	WBAI Free Music Store, New York, NY / US	January 1974
	Musee Galliera, Paris, FR	October 1976
	Galerie Shandar, Paris, FR	December 1976
	LA.I.C.A., Los Angeles, CA / US	July – August 1979
	Walker Art Center, Minneapolis, MI / US	June 1980
	P.S. 1, New York, NY / US	April 1980
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	September – November 2010
Thanks to:	Maureen Mitchell-Wise, Freddy Schrag	

Dimensions:	Circuit dimensions: 4x7x1 inches
	Installation dimensions: variable
Materials:	hybrid analog-digital electronics, sound

See also Forest Booties, 1980 Lovely Music 7-inch LP → 268



THE PYGMY GAMELAN



Sounds and the Shadows of Sounds

I n s t a l l a t i o n 1979

A computer quietly listens for pitched sounds in the environment for a while, analyses what it hears, then plays the spectral »shadows« of its memories as slowly shifting patterns of filtered white noise from the interchannel hash of a police scanner. Ein Computer durchsucht seine Umgebung eine Zeitlang nach Klängen mit deutlich wahrnehmbarer Tonhöhe, analysiert was er hört und gibt dann geisterhafte »Schatten« seiner Erinnerungen als sich langsam verändernde Muster gefilterten weißen Rauschens aus dem Zwischenkanalmischmasch eines Funkscanners wieder

When Isaac Newton coined the term »spectrum« to refer to the colors of the rainbow he had in mind the idea of the spirit world — that the individual colors that make up white light are somehow the »ghosts« of light. This term has been applied analogously to sound and to all manners of signals that can be represented in the frequency domain. *Sounds and the Shadows of Sounds* retains this spirit in the means of its operation. A specialized analog circuit, the Gentle Electric pitch follower, designed by Carl Fravel, supplies a Kim-1 computer with information about pitched sounds in the environment. The computer keeps track of these and updates a series of histograms which it uses to control a series of 36 bandpass resonant filters that cover the audio spectrum, resulting in a slowly shifting composition made of filtered white noise. The noise source is the inter-station noise from a police-band radio, not ideal acoustically, but serving as a channel of contact with another world.

Als Isaac Newton für die Farben des Regenbogens den Begriff »Spektrum« prägte, dachte er dabei an die Geisterwelt — dass die einzelnen Farben, aus denen sich das weiße Licht zusammensetzt, in gewisser Weise Licht-»Geister« seien. Der Begriff wurde analog auch auf akustische Ereignisse und andere Signalarten übertragen, die sich im Frequenzbereich abbilden lassen. Die Installation *Sounds and the Shadows of Sounds* bewahrt diesen Geist in den Mitteln, mit denen sie arbeitet. Ein spezieller analoger Schaltkreis, der von Carl Fravel entwickelte Gentle Electric Tonhöhenverfolger beliefert einen Kim-1-Computer mit Informationen über Umgebungsklänge mit einer bestimmten Tonhöhe. Der Computer verfolgt diese und aktualisiert damit eine Reihe von Histogrammen, mit denen er 36 das gesamte Audiospektrum abdeckende Bandpassfilter steuert, sodass eine sich langsam verändernde Komposition aus gefiltertem weißen Rauschen entsteht. Quelle dafür ist das Zwischenstationsrauschen eines Polizeifunkscanners, das zwar akustisch nicht ideal ist, aber einen Verbindungskanal zu einer anderen Welt darstellt.

Dimensions:	variable
Materials:	custom 36-channel resonant filter-bank controlled by Kim-1 Computer, Radio Shack police band radio, Gentle Electric pitch follower, microphone, loudspeakers, ambient sound, filtered white noise

Exhibited at:	80 Langton St, San Francsico, CA / US	January – March 1980
	Media Studies, Buffalo, NY / US	December 1980







The Music Room

Interactive music system 1982

A multi-player interactive music system consisting of five touch-sensitive guitars connected to a computer that allows people with no previous musical training to engage in a lively musical dialog. Ein aus fünf berührungsempfindlichen, mit einem Rechner verbundenen Gitarren bestehendes interaktives Multiplayer-Musiksystem, mit dem man ohne jede musikalische Vorbildung in einen lebendigen musikalischen Dialog treten kann.

Commissioned by The Exploratorium in 1981, *The Music Room* was the forerunner of many automatic music systems that have since become a part of the gaming world. Software-based musical intelligence interprets the performative gestures of the five players, correcting for errors in tone and timing, and uses a number of synergetic features to enhance the groove that develops among players.

Der 1981 von The Exploratorium in Auftrag gegebene *Music Room* war ein Vorläufer der vielen automatischen Musiksysteme, die mittlerweile einen festen Bestandteil der Spielewelt bilden. Eine softwaregestützte musikalische Intelligenz interpretiert die performativen Gesten der fünf Spieler/innen, korrigiert Intonations- und Timingfehler und verstärkt den zwischen den Spieler/innen entstehenden Groove durch eine Reihe Synergie fördernder Funktionen.

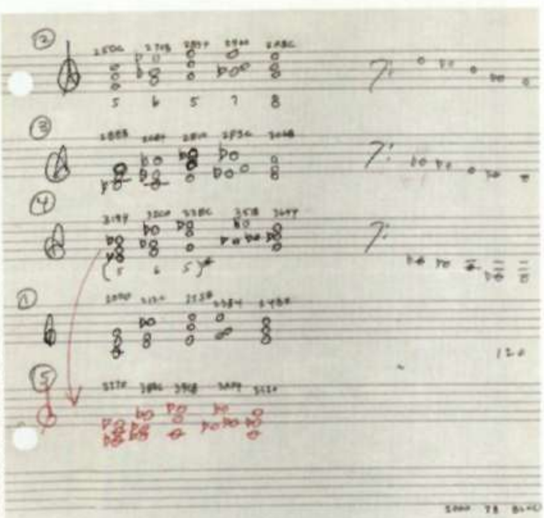
Exhibited at:	The Exploratorium, San Francisco, CA / US	Permanent collection 1982
	The Wadsworth Atheneum, Hartford, CT / US	January – March 1984
	The Ontario Science Centre, CA	Permanent collection 1984
	The Pittsburgh Children's Museum, PA / US	Permanent collection 1985
	Touch the Universe, Manitoba Museum, Winnipeg, CA	Permanent collection 1985
	The Boston Children's Museum, MA / US	Permanent collection 1986
	Technorama der Schweiz, Winterthur, CH	September 1990 – May 1991
	Museo El Papalote, Mexico City, MX	Permanent Collection 1992
Thanks to:	Frank Oppenheimer, Peter Richards, The Exploratorium, Ed Tannenbaum, David Behrman, Kevin Osborn	

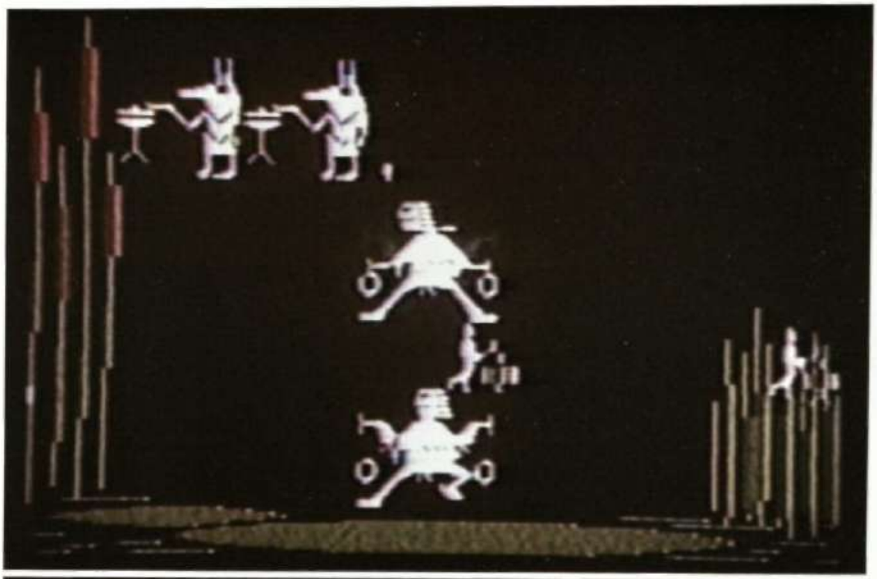
Dimensions:	15 feet diameter, 12 feet high
Materials:	computers, sound, custom guitar-like interface, Apple-II (1 MHz 6502 processor, 48K RAM), Roland Rhythm machine, Casio MT-30 synthesizers, custom interface hardware, wood, glass. Programmed in Forth

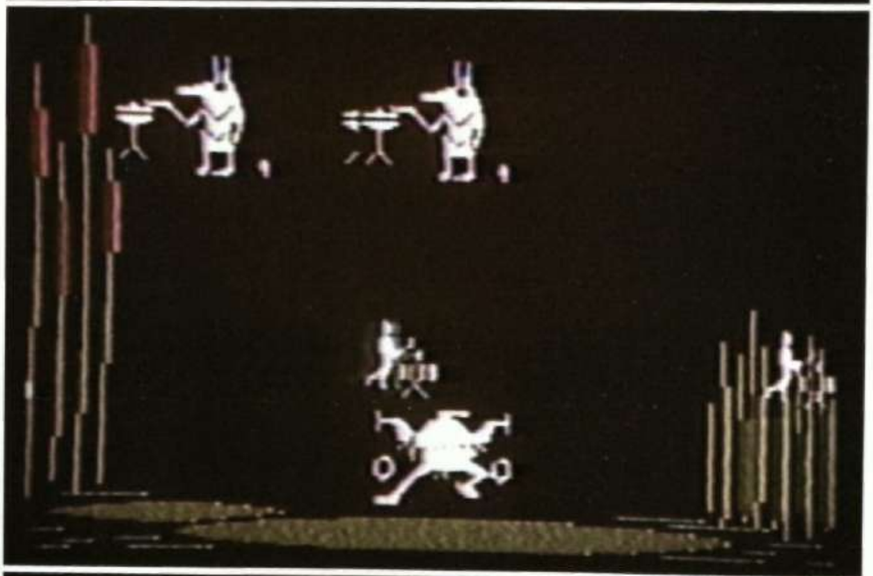


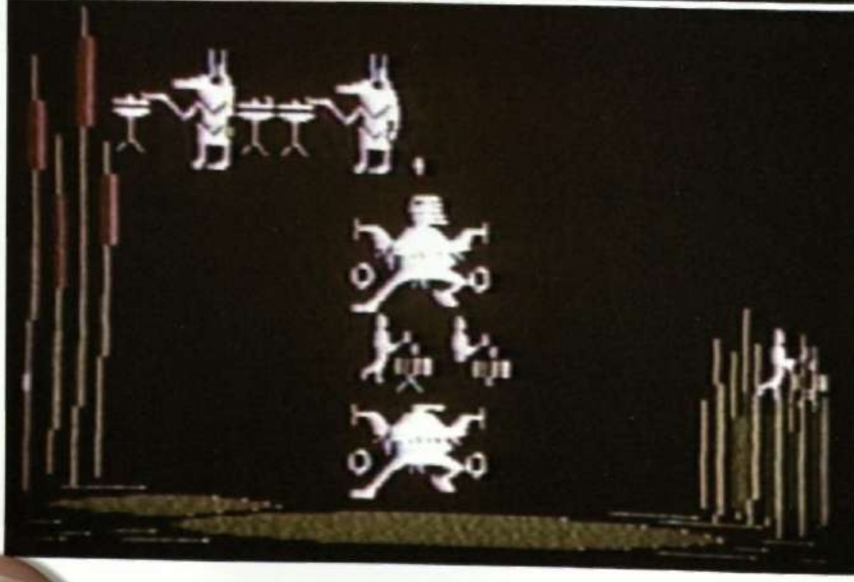
Swinging Saudi

Prince Talal bin Abdul Aziz al Saud, brother of King Fahd of Saudi Arabia, played a electronic touch-sensitive guitar connected to a computer yesterday at the San Francisco Exploratorium. He was in the Bay Area during a five-city tour of the United States.









Sound Fountain

in collaboration with David Behrman* Installation 1982

Touch sensitive sticks make music and move computer-generated creatures around a video screen. Auf berührungsempfindlichen Gitarrengriffbrettern kann man Musik erzeugen und computergenerierte Kreaturen über einen Videomonitor bewegen

Both David and I had both been working with microcomputers since the Kim-1 days and had collaborated informally on a number of projects, sharing ideas and designs for interactive electronic systems and audio generation and processing. Our collaborative work *Sound Fountain* brought together a number of these elements with our first foray into real-time computer graphics. When the project was first conceived we were both independent sound artists working with computers. A year later, possibly due to our track record with *Sound Fountain*, we were both employed in the video game industry as programmers, David at CTW and I at Atari, a dubious enterprise for two pioneers of electronic art.

Sound Fountain was conceived to open up the interactive performance tools we had been developing in the context of performance activities to broader audiences at museums and festivals. In particular we used the capacitive touch sensor technology we had developed for our guitar-like interface as a readily accessible controller. The videogame-like graphics were not then intended as the retro-styled references to popular culture they now appear to be, but were the apex of what was achievable with the 8-bit 1 MHz 4-bit-color technology of the time. In 1982, no other real-time interactive computer sound and graphics applications existed within the realm of art, so our situation was tantamount to being independent explorers on horseback in a landscape that was just about to become a freeway populated by speeding trailer-trucks.

The Danceteria version was a souped-up four-player version that featured the guitar-sticks mounted on the sides of a table top that housed a Sony Trinitron monitor. At the screen's center a large angry baby head vomited forth musical icons that the four players had to intercept by touching the touch sensitive guitar frets.

*David Behrman (*1938) has been active as a composer and artist since the 1960s. Over the years he has made sound and multimedia installations for gallery spaces as well as compositions for performance in concerts. *My Dear Siegfried*, *Leapday Night*, *On the Other Ocean*, *Interspecies Smalltalk* and *Long Throw* are among Behrman's works for soloists and small ensembles. *Pen Light* (1998) and *View Finder* (2002) are his most recent multimedia installations. Audio recordings of his works can be found on the XI and Lovely Music labels; videos can be viewed at roulette.org and ubu.com.

David und ich hatten unabhängig voneinander seit Kim-1-Tagen mit Mikrocomputern gearbeitet und bei einer Reihe von Projekten auch informell zusammengearbeitet. Dabei tauschten wir immer wieder Ideen und Bauformen für interaktive elektronische Systeme und für Klangerzeugung und Klangbearbeitung aus. Unsere Gemeinschaftsarbeit *Sound Fountain* führte eine Reihe dieser Elemente zusammen und verband sie mit einem ersten Ausflug in die Echtzeit-Computergrafik. Als wir das Projekt konzipierten, waren wir beide unabhängige, mit Computern arbeitende Klangkünstler. Ein Jahr später waren wir, wohl aufgrund der Erfolgsgeschichte mit *Sound Fountain*, als Programmierer in der Videospielindustrie tätig, David bei CTW und ich bei Atari — eine fragwürdige Beschäftigung für zwei Pioniere der elektronischen Kunst.

Sound Fountain sollte die im Kontext diverser Performance-Aktivitäten entwickelten interaktiven Tools für ein breiteres Publikum in Museen und bei Festivals zugänglich machen. Genauer gesagt, nutzten wir die kapazitive Berührungssensortechnik, die wir für unser gitarrenähnliches Interface entwickelt hatten, als leicht zugänglichen Controller. Die videospielartige Grafik war nicht als Retro-Referenz auf die Populärkultur gedacht, als die sie heute erscheinen könnte, sondern stellte den Gipfel dessen dar, was mit der damaligen 8-Bit-1-MHz-Technologie und 4 Bit Farbtiefe möglich war. 1982 gab es im Kunstbereich noch keine in Echtzeit arbeitenden interaktiven Audio- und Grafikprogramme, sodass unsere Situation der unabhängiger Forscher glich, die zu Pferd durch eine Landschaft reiten, die gerade im Begriff steht, zu einer von rasenden Sattelschleppern bevölkerten Autobahn zu werden.

Die Danceteria-Version war eine aufpolierte Version für vier Spieler/innen, bei der die Gitarrengriffbretter an den vier Seiten einer Tischplatte montiert waren, in die ein Sony Trinitron Monitor eingelassen war. In der Bildschirmmitte spie ein großer zorniger Babykopf Musikpiktogramme aus, die die Spieler/innen durch Berühren der Gitarrenbünde abfangen sollten.

David Behrman (*1938) ist seit den 1960er Jahren als Komponist und Künstler tätig. Er hat im Lauf der Jahre sowohl Klang- und Multimediainstallationen für Galerieräume wie auch Kompositionen für konzertante Aufführungen geschaffen. Zu seinen Kompositionen für Solisten und kleine Ensembles gehören unter anderem *My Dear Siegfried*, *Leapday Night*, *On the Other Ocean*, *Interspecies Smalltalk* und *Long Throw*. *Pen Light* (1998) und *View Finder* (2002) waren seine letzten Multimediainstallationen. Audio-Aufnahmen seiner Werke sind auf den Labels XI und Lovely Music erschienen; Videos sind auf roulette.org und ubu.com zu sehen.

Exhibited at:	The Hudson River Museum, Yonkers, NY/US	March – April 1982
	Museum of Contemporary Art, Chicago, IL/US	June 1982
	Four-player video game version commissioned by Danceteria, New York, 1983	

Materials:	Apple II computer (1 MHz 6502, 48 K RAM),
	TMS9918 Sprite Video Display Processor,
	Forth (programming language)




GENERAL ELECTRIC

Voice Creatures

Installation 1986

A series of synthetic vocal personalities, including two radio-genies, »Ted« and »Bud« and a sewer-saint, »Ramon« who respond to visitors' voices with phrases, moans, and secret codes. In a close-coupled environment they speak among themselves. Eine Reihe synthetischer Stimmpersönlichkeiten, zwei Radio-Dschinns namens »Ted« und »Bud« und ein Kanal-Heiliger namens »Ramon«, reagieren auf Besucherstimmen mit Phrasen, Stöhnlauten und Geheimsprachen. Wenn das Environment direktverkoppelt ist, sprechen die Stimmen miteinander

The *Voice Creatures* are three synthetic personalities built into domestic objects: two inhabit old radios, the third the drain of a kitchen sink. Each is based on a system of voice recognition and synthesis using linear-predictive coding, running on an Apple-II computer with special voice analysis/synthesis hardware. Microphones pick up the speech of visitors, which is subjected to analysis and the software responds with vocalizations based on its own repertoire of speech sounds. When the ambient noise level goes down, the creatures begin to speak among themselves, pausing to listen, then responding in their own style.

Ramon speaks in moans and whispers with a throaty resonance enhanced by a 10 foot long section of corrugated 4-inch sewer pipe that is coiled under the sink he inhabits. Ted speaks in the military alphabetic code »Alpha, Baker, Charlie…« spelling out these selfsame words as the entire content of his transmission.

Bud speaks in an etheric psychic language that combines the names of Elizabethan composers with terms of John Dee's angelic language.

Exhibited at:	Soundwaves Show at N.Y. City Gallery, NY / US	May – June 1986
	Thorpe Intermedia Gallery, Sparkhill, NY / US	July – August 1986
	Works Gallery, San Jose, CA / US	June 1989
Thanks to:	Bill and Mary Buchen, Ted Morgan, Bud Hassink	

Die *Voice Creatures* sind drei in Haushaltsgegenstände eingebaute synthetische Persönlichkeiten: zwei sind in alten Radios untergebracht, die dritte im Abfluss einer Küchenspüle. Alle drei beruhen auf einem LPC-Spracherkennungs- und Sprachsynthese-System, das auf einem mit spezieller Hardware aufgerüsteten Apple-II-Rechner läuft. Die mit Mikrofonen aufgenommenen Besucherstimmen werden analysiert, und die Software beantwortet sie mit Äußerungen, die sie aus dem eigenen Sprach- und Lautrepertoire zusammensetzt. Sinkt der allgemeine Geräuschpegel, unterhalten sich die Kreaturen miteinander. Sie hören zu und antworten dann in ihrem jeweiligen Stil.

Ramon spricht in Form von Stöhn- und Flüsterlauten, deren kehliger Charakter durch einen unter dem Spülbecken angebrachten 10 Fuß langen Abflussschlauch aus Plastik noch verstärkt wird. Ted spricht im militärischen Buchstabiercode »Alpha, Baker, Charlie…«, der zugleich den gesamten Inhalt seiner Äußerungen bildet. Bud spricht eine ätherisch-übersinnliche Sprache, in der sich die Namen elisabethanischer Komponisten mit John Dees Engelssprache verbinden.

Dimensions:	variable
Material:	Apple II computers (48 K RAM),
	Forth (programming language),
	Micromint Lis'ner 1000 Voice Recognition and
	Synthesis Boards, old radio cabinets,
	kitchen sink and cabinet

NATIONAL SECURITY AGENCY
FORT GEORGE G. MEADE, MARYLAND 20755-6000

Serial: V2-141-88
16 August 1988

RECEIVED
AUG 2 2 1988
Ans'd............

Robert L. White
Director
Exploratorium
3601 Lyon Street
San Francisco, CA 94123

Dear Mr. White:

We are in receipt of your letter to Tom Tremain, dated May 3, 1988, requesting licensing to use an implementation of the National Security Agency (NSA) LPC-10 algorithm in your exhibit on the acoustics of speech.

We apologize for our late response to your request. The NSA and Texas Instruments (TI) have been in negotiation concerning the LPC-10 algorithm. Negotiations are now complete.

In accordance to the terms set forth in the Agreement, please be advised that TI will make determination of all requests for release of the TI-developed LPC-10 algorithm on their TMS320C25. Therefore, you should address your request to TI.

There is to be no mention of, or credit given to NSA on your exhibit. However, you may mention a Government Standard, but it is not required.

Our best wishes for a successful exhibit.

Sincerely,

DALE A. LEARN
Director
Office of Secure Voice Systems



Alien Voices

Interactive Installation 1988

Alien Voices explores the regions between music and language. Visitors enter two antique wood and glass telephone booths, engage in conversation, hearing the melody of their voices translated into music or changed into whispers, robotic monotones or alien melodies. Alien Voices erkundet den Bereich zwischen Musik und Sprache. Besucher betreten zwei traditionelle englische Telefonzellen, beginnen ein Gespräch miteinander und bekommen dabei ihre Sprechmelodie in Musik, Flüstern, Roboterstimmen oder außerirdische Klänge übersetzt.

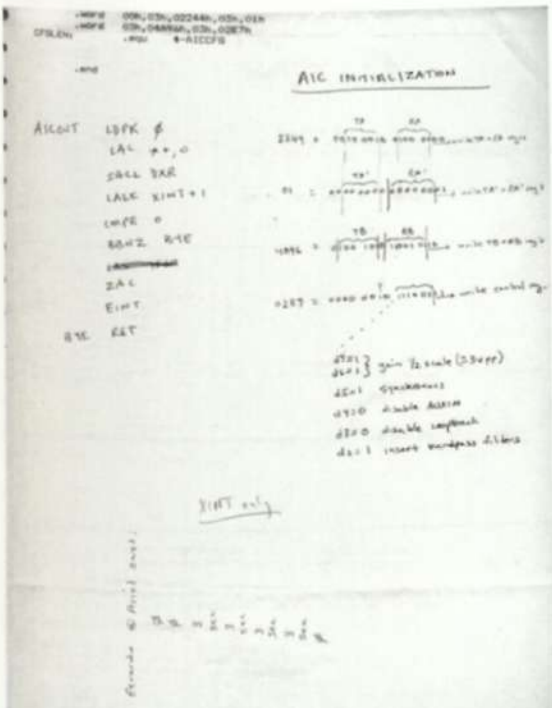
Visitors enter two antique wood and glass telephone booths that are located next to each other. By picking up the telephone handsets they can speak with each other but with the intervention of signal processing software that analyzes and resynthesizes their voices in real time. Parameters such as frequency, amplitude, pitchset (melodic analysis) and voiced/unvoiced sounds are used, along with a palette of user-selectable effects, to intervene in the voice resynthesis. High pitched voices, such as those of children, can be transposed downward and low voices upward to effect a shift of apparent size/gender/age status; melodic contours can be entirely replaced with synthetic pitch trajectories that make the voice appear to be nervous, or whiny. Voiced speech can become whispers, or the users can be made to speak backwards.

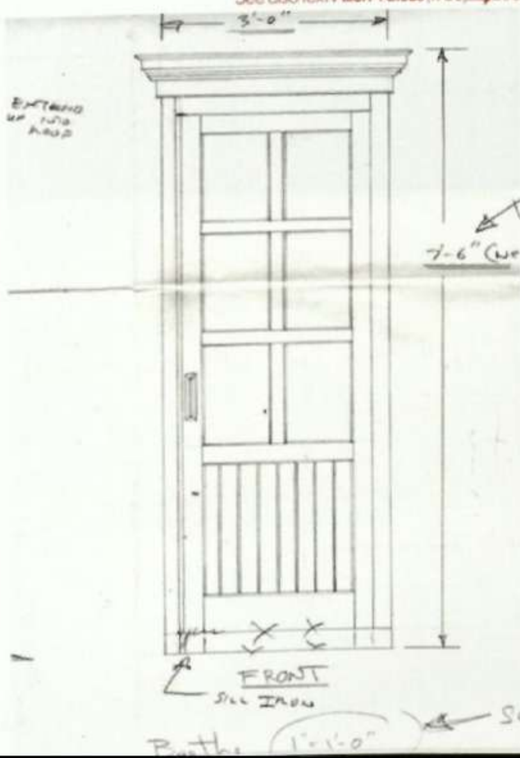
Die Arbeit besteht aus zwei nebeneinander aufgestellten traditionellen Telefonzellen, in die man eintreten kann, um miteinander zu telefonieren. Eine zwischengeschaltete Signalverarbeitungssoftware analysiert dabei die Stimmen in Echtzeit und setzt sie wieder neu zusammen. Die Resynthese wird durch Eingriffe in Parameter wie Frequenz, Amplitude, Tonfolge (melodische Analyse), Stimmhaftigkeit/Stimmlosigkeit sowie mit einer Reihe frei wählbarer Effekte manipuliert. Hohe Stimmen, wie etwa die von Kindern, lassen sich nach unten, tiefe nach oben transponieren und so die mit ihnen verbundene Vorstellung von Größe/Geschlecht/Alter verändern; melodische Konturen können vollständig durch synthetische Tonfolgen ersetzt werden, so dass sich die Stimme nervös oder weinerlich anhört. Stimmhaftes Sprechen lässt sich in Flüstern verwandeln, die gesamte Sprachäußerung rückwärts wiedergeben.

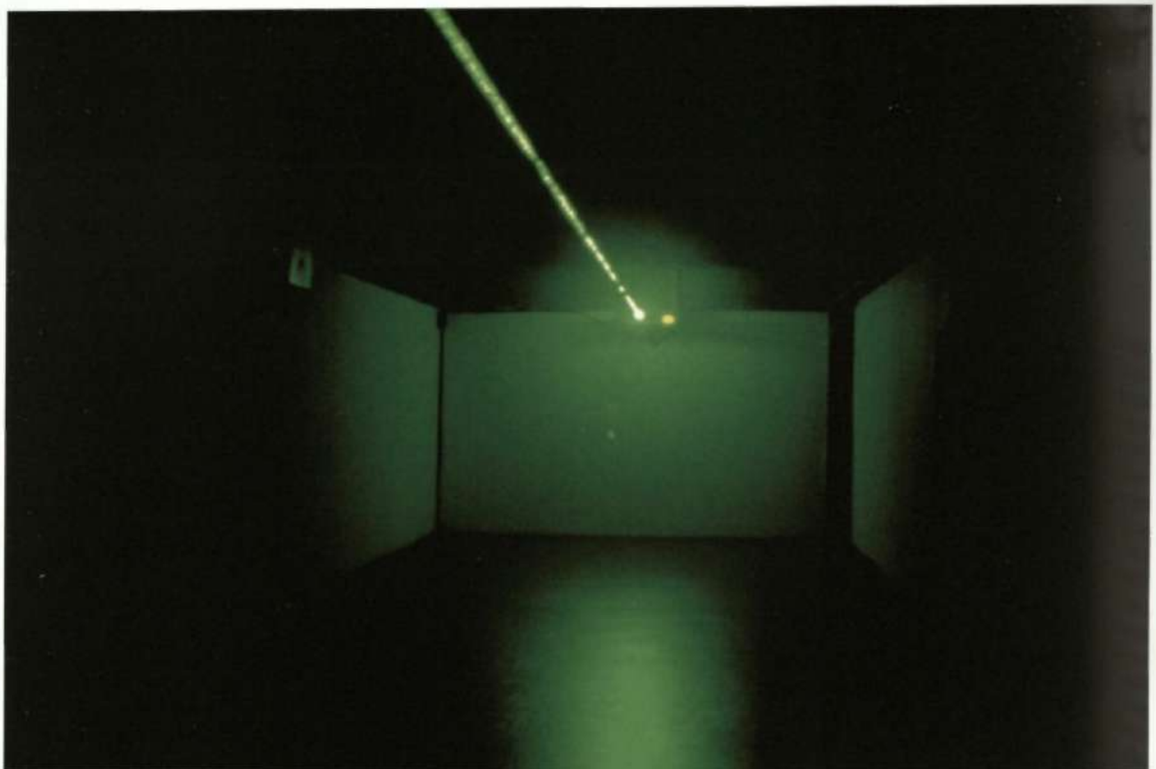
Exhibited at:	The Exploratorium, San Francisco, CA / US	Permanent collection, 1989
	Kanagawa Science Park, Kawasakishi, JP	Permanent collection, 1989
	World Financial Center, New York City, NY / US	March – May 1990
	Technorama der Schweiz, Winterthur, CH	Sept 1990 – May 1991
	Multimediale II, Karlsruhe, DE	June 1991
	Electronic Carnival, Lollapalooza Tour, US	July – Sept 1994
	phaeno Museum, Wolfsburg, DE	Permanent collection, 2005
	Technorama der Schweiz, Winterthur, CH	Permanent collection, 2005
Thanks to:	Peter Richards, The Exploratorium, Panos E. Papamichalis, John Dellamorte	

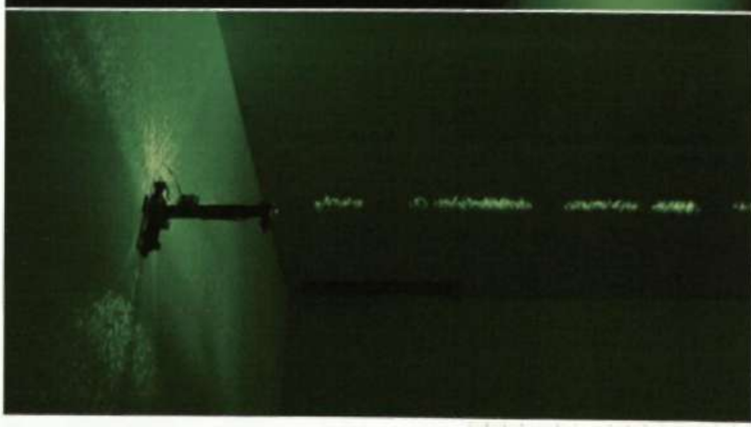
Dimensions:	Booth dimension: 4 x 4 x 9 feet. Variable distance between booths
Materials:	computers, custom digital signal processing hardware & software based on LPC-10 algorithm, sound, 2 IBM AT-286 computers, 2 TMS320C25 DSP cards, custom audio and control hardware, wood, glass, telephone handsets. Later versions use Macintosh computers with Max/MSP

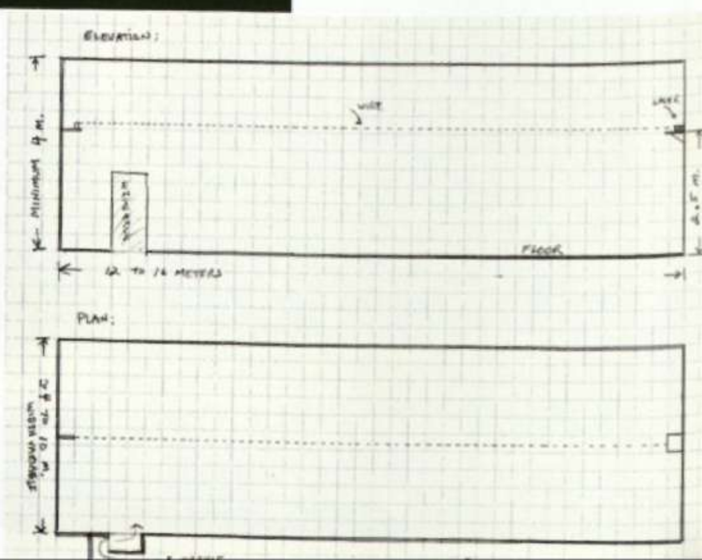
See also text **Alien Voices** (1988) → 208










ELEVATION:
MINIMUM 4 M.
WIRE
LASER
FLOOR
12 TO 16 METERS
PLAN:

Fireflies Alight on the Abacus of Al-Farabi

Installation 1989 revised 1997

A 50 foot long vibrating music wire is stretched in a dark room and illumined by an emerald laser beam. Little loops of monofilament dance on the harmonic nodes of the wire, producing flickering points of light and Aeolian harp-like sounds. Eine 15 Meter lange Saite mit kleinen tanzenden Nylonschlaufen wird durch einen vollständig abgedunkelten Raum gespannt und mit einem Smaragdlaserstrahl beleuchtet. Die Schlaufen tanzen auf den Obertonknoten der Saite, produzieren dabei flackernde Lichtpunkte und Klänge, die an eine Äolsharfe erinnern.

Fireflies Alight on the Abacus of Al-Farabi centers on a visualization of the oldest music-theoretical device, the monochord, used since the times of Pythagoras to study and explain the mysteries of sound, music and the universe. The monochord is essentially a vibrating string that can be divided into various proportions to sound the different notes of the scale, the way the vibrating guitar string sounds higher when it is shortened. By measuring the ratios of the lengths of the sections, the proper tuning ratios of music can be discerned. Among the many accomplishments of the 10th century Persian mathematician Al-Farabi was the derivation of the entire 17-note musical scale by the subdivisions of a single long vibrating string.

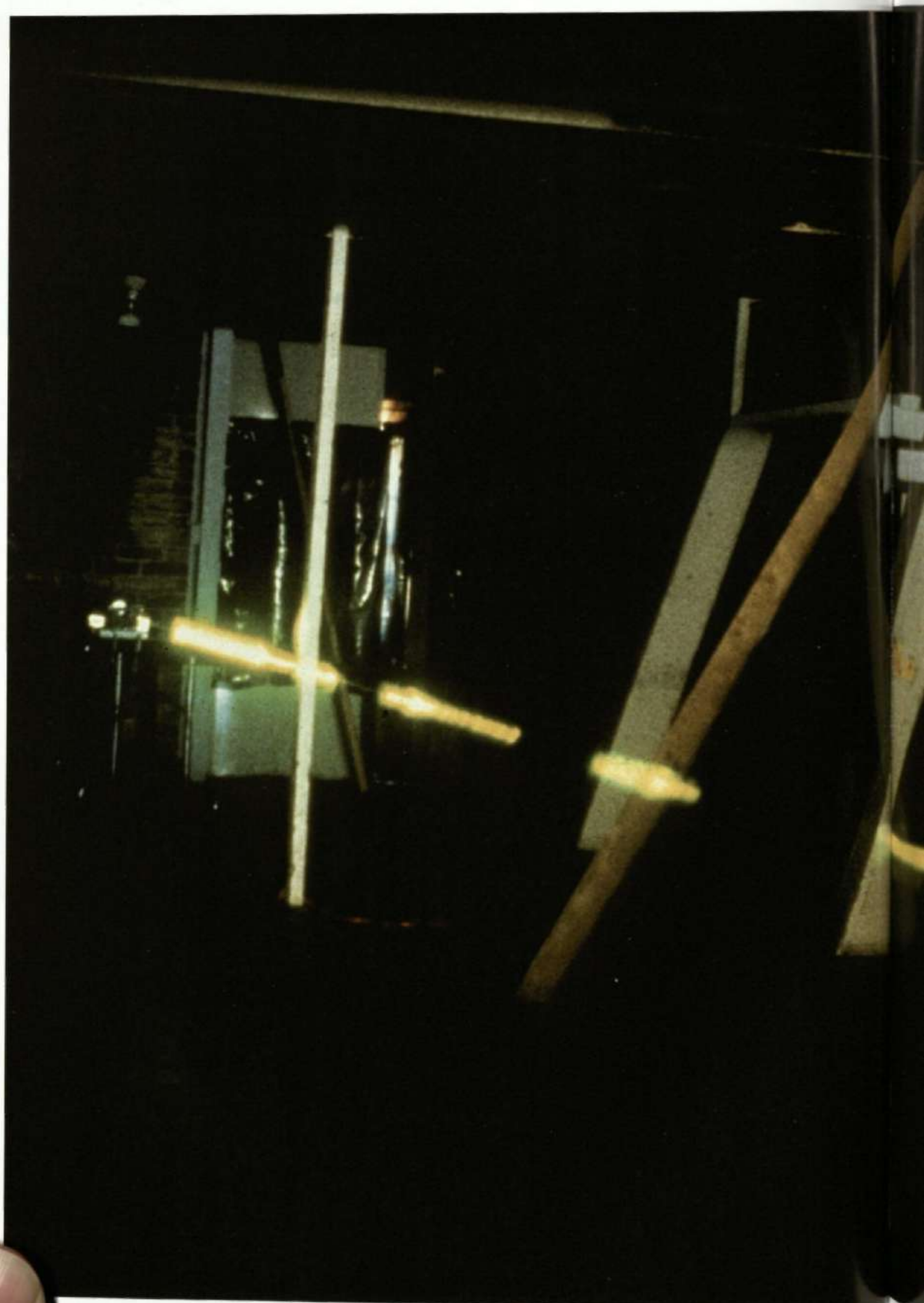
In my installation, one very long piece of music wire is made to vibrate at a very low frequency. In its flow and turbulence are contained a myriad of partial vibrations. A number of small loops of monofilament are allowed to dance upon the wire, each one ceaselessly seeking a point of rest on a harmonic node, a theoretical point of stability. In a sense, the wire is a machine for calculating its own harmonics. No resting place, however, really exists, as every move and displacement of the other loops upsets the fragile harmonic balance. Since the loops touch ever so lightly upon the wire, they act as tangents that mark off a certain harmonic between two loops, giving rise to the many harmonic elements in the sound of the wire. These sounds are picked up by contact microphones and sent to loudspeakers. As the loops dance around, they intersect a beam of green laser light and so light up, revealing to our eyes the patterns of vibration in space. There is no equilibrium, only change, and harmonies are just passing hints at an order that can only exist in the mind. I imagine these truths to be revealed to ancient philosophers in the dark hours of night as the glowing insects undertake their rituals on the mathematician's monochord.

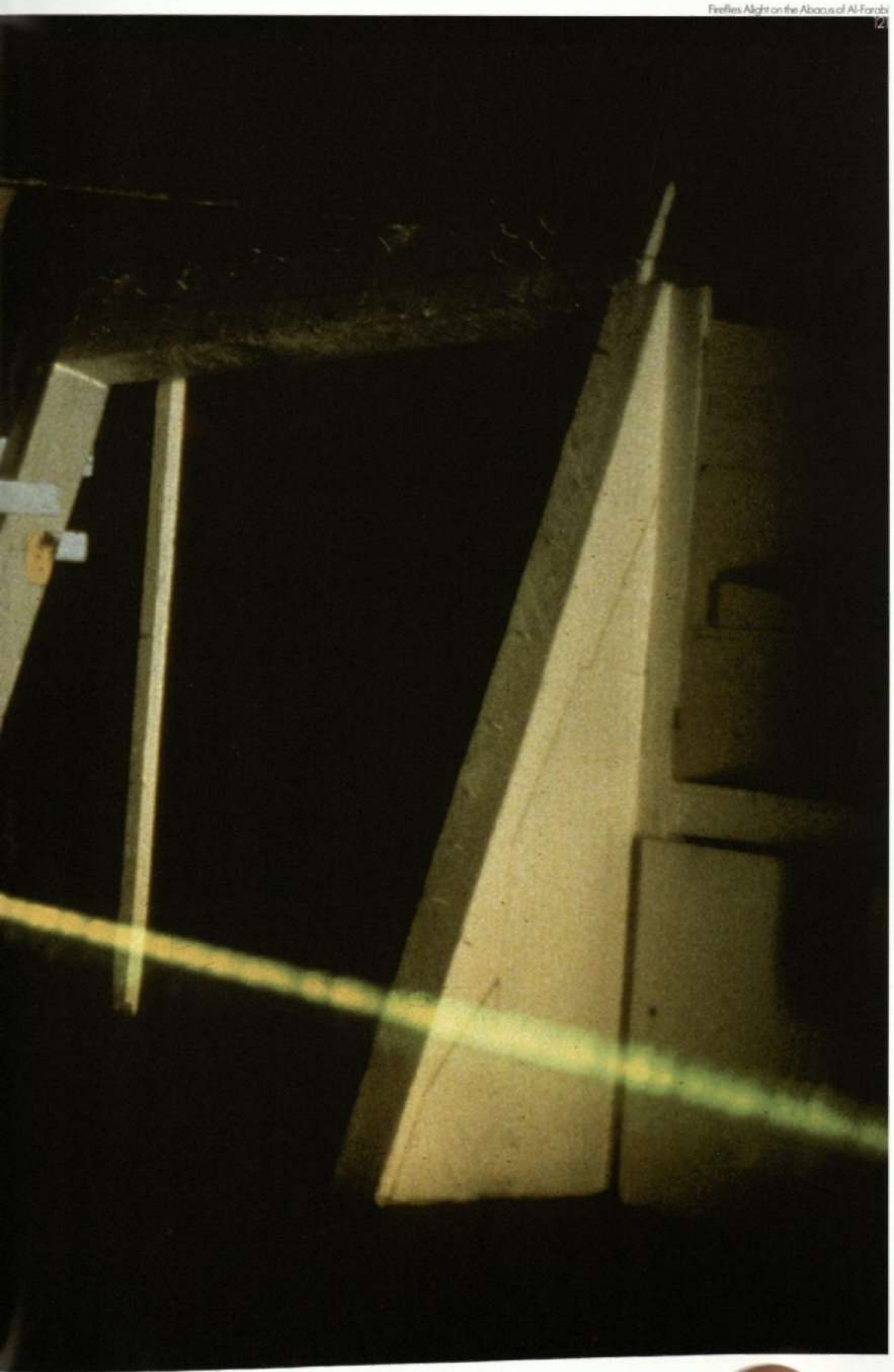
Fireflies Alight on the Abacus of Al-Farabi ist im Grunde eine Visualisierung des ältesten Hilfsmittels der Musiktheorie, des Monochords, mit dem seit Pythagoras die Mysterien des Klangs, der Musik und des Kosmos erforscht und erklärt werden. Das Monochord besteht im Wesentlichen aus einer einzigen, in verschiedenen Proportionen teilbaren Saite zur Wiedergabe der Tonleiter, ähnlich wie der Ton einer Gitarrensaite erhöht wird, indem man sie verkürzt. Durch Messung der Länge der beiden Teilabschnitte lassen sich die richtigen Stimmungsverhältnisse festlegen. Die Ableitung der gesamten 17-stufigen persisch-arabischen Tonleiter durch die Unterteilung einer langen schwingenden Saite ist eine der vielen Errungenschaften des im 10. Jahrhundert wirkenden persischen Mathematikers Al-Farabi.

In meiner Installation wird eine sehr lange Saite in eine niederfrequente Schwingung versetzt, die in unzählige Teilschwingungen zerfällt. Auf der Saite tanzen eine Reihe kleiner Nylonschlaufen, die unablässig auf der Suche nach einem harmonischen Knoten, einem theoretischen Ruhepunkt sind. In gewisser Weise ist die Saite also eine Maschine, die ihre eigene Harmonik berechnet. Es gibt auf ihr allerdings keinen wirklichen Ruhepunkt, da die Bewegungen der anderen Schlaufen immer wieder das fragile harmonische Gleichgewicht stören. Insofern die Schlaufen die Saite ganz leicht berühren, fungieren sie als Tangenten, die ein bestimmtes harmonisches Verhältnis zwischen zwei Schlaufen markieren und die vielen harmonischen Elemente im Klang der Saite zum Vorschein bringen. Diese Klänge werden mit Kontaktmikrofonen abgenommen und über Lautsprecher wiedergegeben. Die tanzenden Schlaufen leuchten in einem grünen Laserstrahl auf, wodurch die Schwingungsmuster auch fürs Auge wahrnehmbar werden. Es entsteht kein Gleichgewicht, alles ist ständig im Wandel, und die Harmonien sind nur vorübergehende Zeichen für eine Ordnung, die lediglich im Kopf existiert. Ich stelle mir vor, wie sich diese Wahrheiten den Philosophen des Altertums in dunklen Nachtstunden erschließen, in denen Leuchtkäfer auf dem Monochord des großen Mathematikers ihre Rituale vollführen.

Exhibited at:	Headlands Center for the Arts, Sausalito, CA / US	June 1989
	San Jose Museum of Art, CA / US	October – December 1989
	Kunstverein Gianozzo, Berlin, DE	March – April 1990
	San Francisco Art Institute Gallery, CA / US	February – March 1993
	Museum City Tenjin, Fukuoka, JP	September – October 1994
	Obscure, Quebec, CA	September – October 1995
	ICC Gallery, Tokyo, JP	August – September 1997
	Groninger Museum, Groningen, NL	March 1998
	Ujazdowski Castle, Warsaw, PL	November 1998
	Galerie Otso, Helsinki, FI	February – March 2000
	Festival Arte Sonoro, Mexico City, MX	June 2000
	Resonanzen, Stadtgalerie Saarbrücken, DE	June – August 2002
	De Puddingfabriek, Groningen, NL	April 2003
	Taipei Fine Arts Museum, TW	September – November 2005
	Honorary Mention, Ars Electronica, Linz, 1999	
Thanks to:	Amoco Laser Co. for loan of laser (1993)	

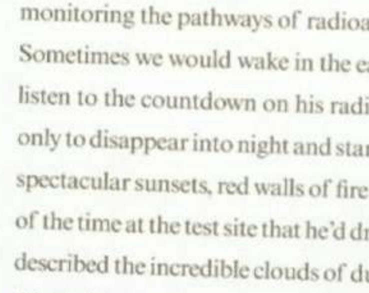
Dimensions:	variable from 25 to 60 feet
Materials:	Nd:YAG laser 532 nm,
	0.0012 diameter steel music wire,
	electromagnets,
	monofilament,
	darkness







›› In 1957 my family moved to Ely, Nevada about 100 miles downwind from the atomic te site. My father, a geneticist, had taken a job with the United States Public Health Servic monitoring the pathways of radioactive fallout through the sparse ecology of the deser Sometimes we would wake in the early hours of the morning to see a bomb go off. We' listen to the countdown on his radio, watch as the sky lit up in premature desert sunris only to disappear into night and stars again. In the days following a test I remember seein spectacular sunsets, red walls of fire in the evening. All the dust, I suppose. My father tol of the time at the test site that he'd driven to ground zero within an hour after the blast. H described the incredible clouds of dust in the air, the desert winds blowing dust into every thing. Afterwards, he said, they were told to shower and change. Years later we learned details of some of the unrecorded tests in which plutonium bombs were destroyed by conventional explosives, I guess to see if they could be vulnerable to terrorist attack. While the bombs didn't go off, kilograms of plutonium was spread across the desert in the form of a fine dust where, I'm sure, it blows around to this day.‹‹



An Unsettling Matter

Installation 1991

Sound and projected image installation based on events of atmospheric atomic tests in the Nevada desert. Auf Vorkommnissen bei den oberirdischen Atomtests in der Wüste von Nevada beruhende Klang- und Bildinstallation

An autobiographical work incorporating family photos, projected panoramic desert landscapes, a small leaden hut, a geiger counter and an old radio. The gallery's white walls are covered by seamless multi projector images of sunrise and sunset panoramas in the Nevada desert. In the center is a hut or child's playhouse, made of sheet lead. Within the hut hang bunches of sagebrush, a radio plays and a nervous Geiger counter ticks away. The radio plays popular music and songs of 1957, soundscapes of the Nevada desert and reports from people who were involved as subjects in the experimental nuclear testing program called Operation Plumbob, a year long suite of atmospheric nuclear detonations that contaminated vast areas of North America and spread radioactive fallout throughout the world. The gallery floor is covered with a harmless but noticeable fluffy sparkling powder that spreads by clinging to visitors who carry it to distant parts of the city.

Eine autobiografische Arbeit mit Familienfotos, projizierten Panoramabildern von Wüstenlandschaften, einer kleinen Bleihütte, einem Geigerzähler und einem alten Radio. Die weißen Wände der Galerie sind nahtlos mit Mehrfachprojektionen von Sonnenauf- und Sonnenuntergängen in der Wüste von Nevada bedeckt. Im Zentrum steht eine mit Bleiblech verkleidete Hütte, die auch ein Kinderspielhaus sein könnte. In der Hütte hängen Wüstenbeifußbüschel, es spielt ein Radio, und ein Geigerzähler tickt nervös. Im Radio hört man Schlager aus dem Jahr 1957, Soundscapes von der Wüste von Nevada und Berichte von Beteiligten an der Operation Plumbomb, einer ein ganzes Jahr lang durchgeführten Serie überirdischer Atomversuche, die weite Landstriche Nordamerikas verseuchten und deren radioaktiver Niederschlag sich über die ganze Welt verteilte. Der Boden ist mit einem harmlosen, aber auffällig glänzenden flockigen Puder bestreut, das an den Besuchern haften bleibt und sich so über die ganze Stadt verteilt.

Exhibited at:	Ars Electronica, Linz, AT	September 1991
	Yellow Springs Institute, Pennsylvania, PA / US	July 1992
Thanks to:	Gottfried Hattinger, Elisabeth Medrano, Rich Lopez, Michael Broad, Jim Pomeroy, Kenneth Atchley, Brian Bailey, Frank DeMarinis	

Dimensions:	installation dimensions variable
Materials:	panoramic projections, Crystalina glitter powder, lead, uranium, Geiger counter, sage, tumbleweed, old tube radio, sound

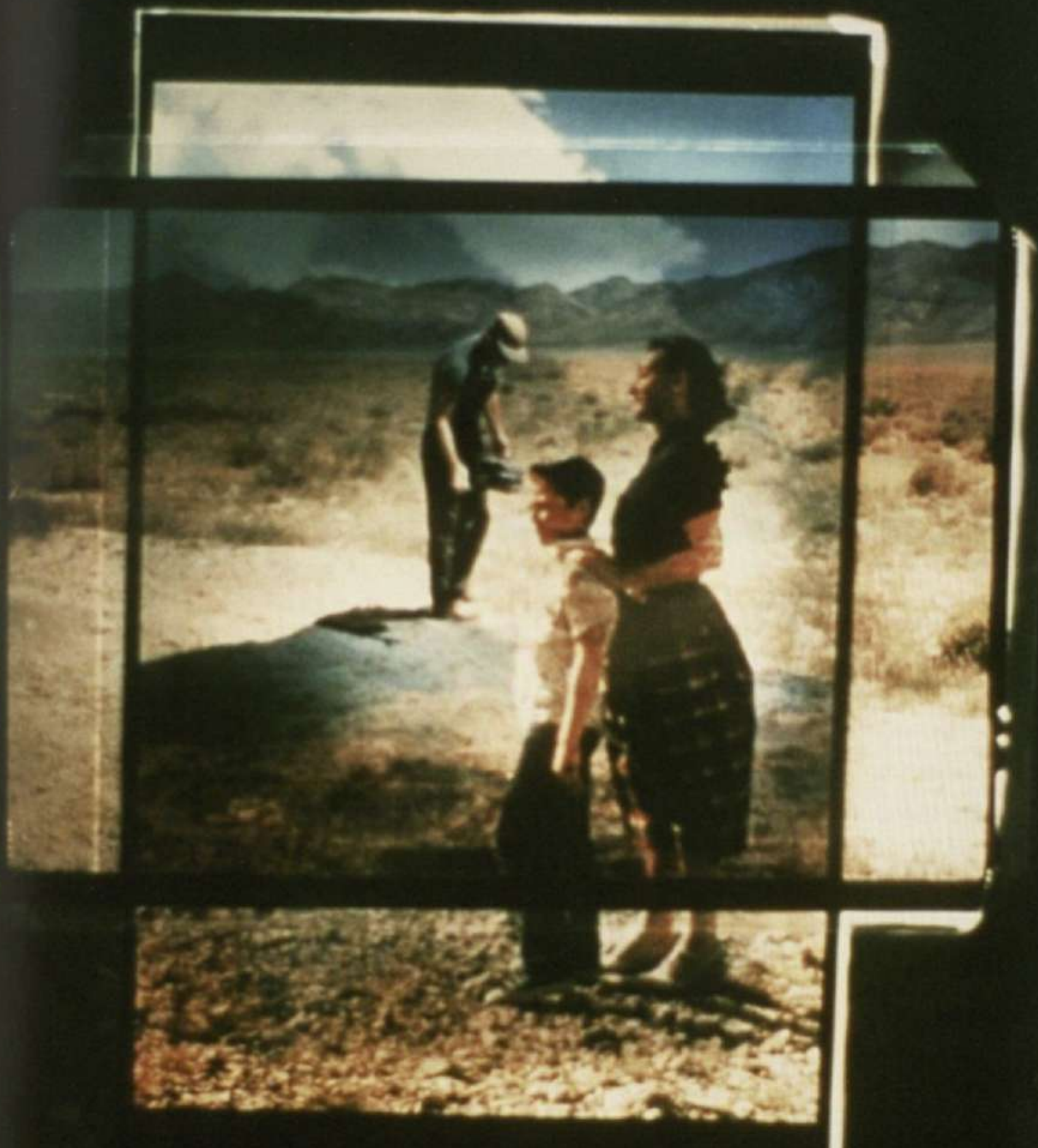




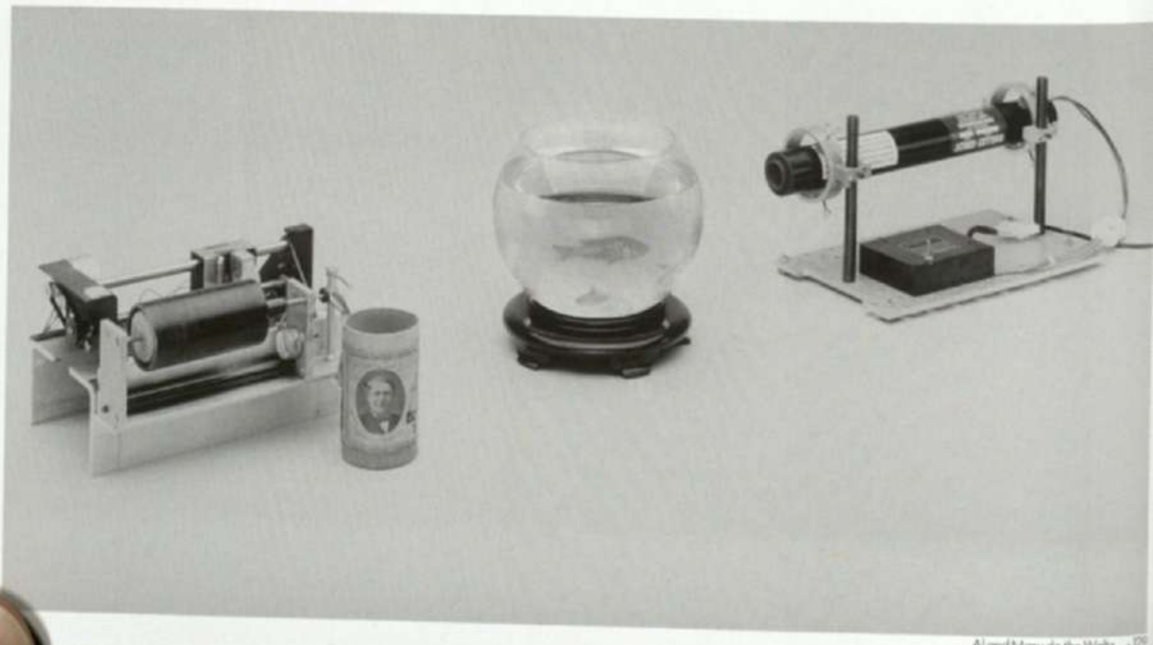
»Im Jahr 1957 ließ sich meine Familie in Ely, Nevada, etwa hundert Kilometer windabwärts vom Atomtestgelände nieder. Mein Vater, ein Genetiker, war bei der U.S.-Gesundheitsbehörde angestellt und überprüfte die Verteilung des radioaktiven Fallout im dürren Ökosystem der Wüste. Manchmal wachten wir in den frühen Morgenstunden auf und sahen eine Bombe explodieren. Wir lauschten dem Countdown in seinem Funkgerät, beobachteten, wie sich der Himmel in einem viel zu frühen Wüstensonnenaufgang verfärbte, um wieder in die Nacht mit ihren Sternen zurückzusinken. Ich erinnere mich, in den Tagen nach solchen Tests spektakuläre Sonnenuntergänge gesehen zu haben, rote abendliche Feuerwände. Von dem ganzen Staub, nehme ich an. Mein Vater erzählte von der Zeit am Testgelände, wie er nur eine Stunde nach der Explosion ins Explosionsgebiet fuhr. Er beschrieb die unglaubliche Staubwolke und wie der Wüstenwind den Staub überallhin blies. Danach, so erzählte er, wurden sie immer aufgefordert, sich zu duschen und umzuziehen. Jahre später erfuhren wir von den inoffiziellen Tests, bei denen sie Plutoniumbomben mit konventionellen Sprengstoffen in die Luft zu jagen versuchten, vermutlich um zu testen, wie anfällig sie für Terroranschläge waren. Die Bomben gingen zwar nicht los, aber es wurde dabei kiloweise Plutonium als feinster Staub in die Wüste geblasen, wo er, da ich bin sicher, bis heute umhergeweht wird.«


Nevada - Sunnyside School
replacement of film Badge
MADE IN U.S.A.
14


27
MADE IN U.S.A.
0006.2603
Nevada - Elderedge
Ranch near Sacramento
Pass, Kusnetz + MX-5
10







The Edison Effect

I n s t a l l a t i o n 1989—1996

Ancient phonograph records, wax cylinders and holograms are scanned with lasers to produce music at once familiar and distant, like some faintly remembered melody running through the head. Alte Schallplatten, Wachszylinder und Hologramme werden mit Lasern abgetastet und akustisch wiedergegeben: eine Musik, die zugleich vertraut und fremd ist wie eine im Kopf herumgeisternde Melodie, an die man sich nur dunkel erinnert.

»The opposition between hearing and staring finds its strange union with the diamond stylus, a diamond above all that writes out sound as well as reflects light.«

Duncan Smith, *The Age of Oil*

The Edison Effect is a series of interactive sculptures that play ancient phonograph records with laser beams. The reflections of light from the walls of the groove carry the audio information to photoelectric devices where it is translated first into an electrical signal, then into sound by a loudspeaker. The resultant sounds range from recognizable to distorted, something like a distant shortwave radio or a haunting bit of a melody just barely remembered. The arrangement of optics, motors and light allow random access to the grooves of the records, permitting distortion, dis-arrangement and de-composition of the musical material.
Each *Edison Effect* player is a meditation on some aspect of the relations among music, memory and the passage of time. Our sense of time, memory, and belonging have all been changed by the exact repetition implicit in mechanical recording. The needle in the groove, no less than the needle in the vein, is one symbolic emblem on our quixotic quest for the perfect moment of fulfillment. Re-played here, without needles, the record becomes what it really is: a holographic object, a simultaneous smorgasbord to be consumed in the order and taste we see fit. The raw and raucous noises of the record surface commingle with the sounds inscribed in the groove, creating a havoc of misinterpreted intentions and benign accidents.

»Der Gegensatz zwischen Hören und Sehen erlebt in der Diamantnadel eine seltsame Aufhebung, liest dieser Diamant doch ebenso Klänge aus wie er Licht reflektiert.«

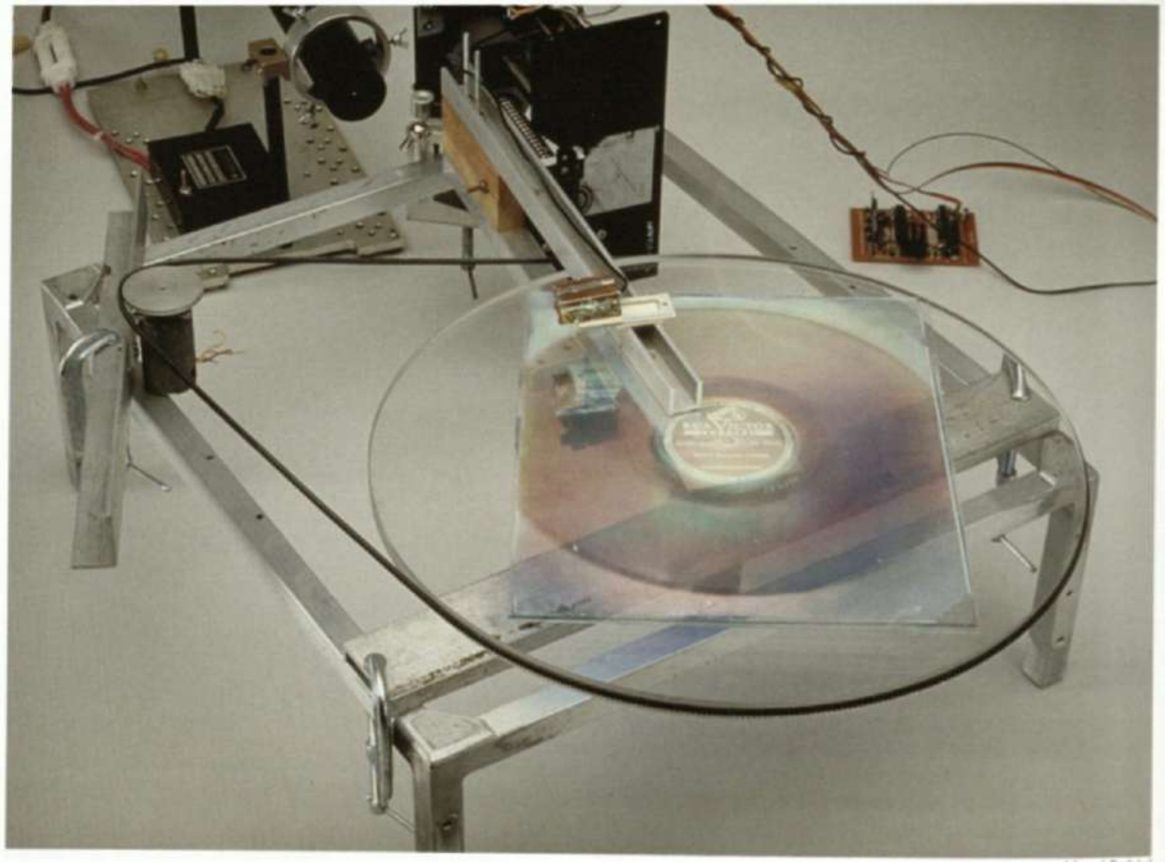
Duncan Smith, *The Age of Oil*

The Edison Effect ist eine Serie interaktiver Skulpturen, bei denen alte Schallplatten mit Laserstrahlen abgespielt werden. Die von den Wänden der Tonrille zurückgeworfenen Lichtreflexe leiten die Audio-Information zu photoelektrischen Wandlerelementen weiter, die sie in ein elektrisches Signal übersetzen, welches schließlich von einem Lautsprecher akustisch wiedergegeben wird. Die so entstehenden Klänge changieren zwischen Wiedererkennbarkeit und Verzerrung, erinnern an einen fernen Kurzwellensender oder das hartnäckig im Kopf herumgeisternde Bruchstück einer kaum erinnerten Melodie. Das Arrangement aus Optik, Motoren und Licht gestattet den beliebigen Zugriff auf die Tonspur der jeweiligen Aufnahme und ermöglicht die Verzerrung, Zergliederung und De-Komposition des musikalischen Materials.
Jedes Abspielgerät dieser Installation ist eine Meditation über einen bestimmten Aspekt im Verhältnis von Musik, Gedächtnis und dem Verrinnen der Zeit. Unsere Wahrnehmung von Zeit, Gedächtnis und Zugehörigkeit hat sich durch die mit der mechanischen Aufnahme einhergehende exakte Wiederholung stark verändert. Die Nadel in der Rille ist wie die Nadel in der Vene ein zentrales Symbol für unsere quichottische Suche nach dem Augenblick vollkommener Erfüllung. So wie die Schallplatte hier abgespielt wird, ohne Nadel, zeigt sie sich als das, was sie eigentlich ist: ein holographisches Objekt, ein Smörgåsbord, bei dem alle

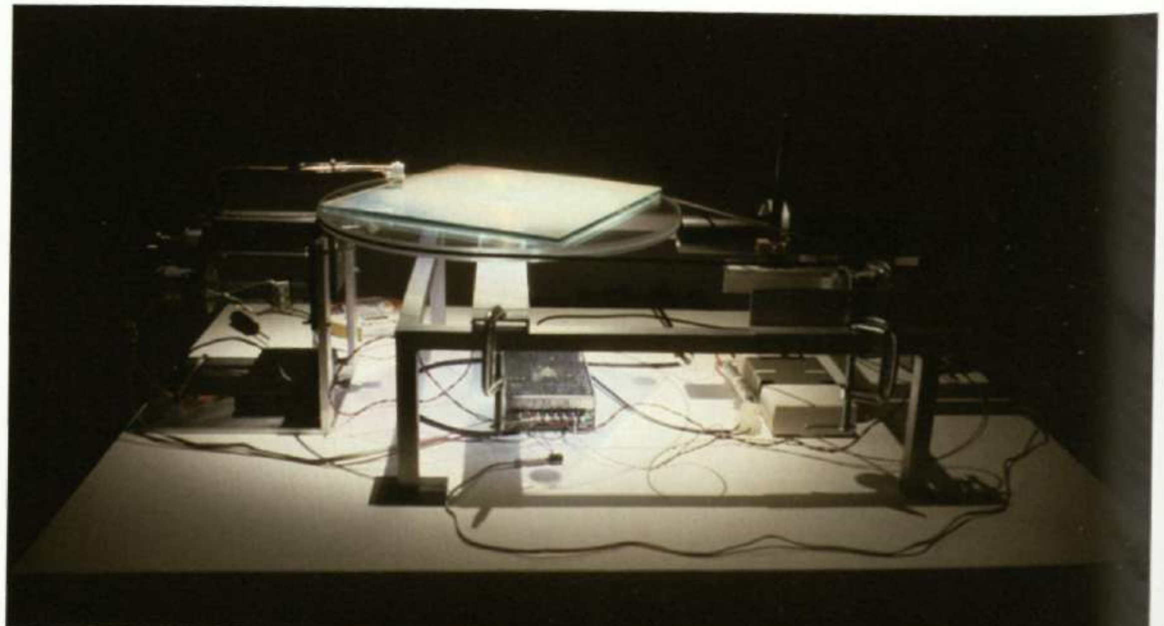
Exhibited at:	Het Apollohuis, Eindhoven, NL	May 1989
	Fuller Gross Gallery, San Francisco, CA / US	July – August 1989
	C.O.C.A. Seattle, WA / US	March – May 1990
	Technorama der Schweiz, Winterthur, CH	September 1990 – May 1991
	Sound Culture, Sydney, AU	October – November 1991
	Threadwaxing Space, New York City, NY / US	September – October 1992
	Palm Beach C.C. Art Museum, Florida, FL / US	November 1992 – January 1993
	San Francisco Art Institute Gallery, CA / US	February – March 1993
	Obscure Gallery, Quebec City, CA	April 1993
	Oliver Art Center, CCA, Oakland, CA / US	February – March 1994
	Teatro Juarez, Guanajuato, MX	March 1994
	Klingende Dinge, Schloss Ottenstein, AT	June – September 1994
	I.S.E.A. Museum of Contemporary Art, Helsinki, FI	August 1994
	Carl Solway Gallery, Cincinnati, OH / US	January – March, 1995
	Bravin Post Lee Gallery, New York, NY / US	January – February 1996
	San Francisco Museum of Modern Art, CA / US	September 1996 – January 1997
	Oberösterreichisches Landesmuseum, Linz, AT	April – May 1997
	ICC Gallery, Tokyo, JP	August – September 1997
	Site Gallery, Sheffield, GB	June – July 1998
	De IJsbreker, Amsterdam, NL	August 1998
	Musee d'Art Contemporain Lyon, FR	February – April 1999
	Ecole d'art de Aix-en-Provence, FR	April – May 1999
	Galerie Otso, Helsinki, FI	February – March 2000
	McColl Center for Visual Art, Charlotte, NC / US	June – September 2001
	NRW Forum, Düsseldorf, DE	September 2002
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	September – November 2010

Dimensions:	variable
Materials:	records, clay pots, holograms, motors, electronics, microcontrollers, lasers, speakers, sound
Thanks to:	Jeanie Weiffenbach, Ann Chandler MacArthur, August Muth, N.E.A. Visual Arts, California Arts Council, The Exploratorium, Randall Fontes, Nick Bertoni, Jim Meder, Jeanette Redensek, Elizabeth Radigoy, Ron Kuivila, Rebecca Cummins, Melanie Walker, Patrick Sumner, Jim Pomeroy, Bruce Tomb, John Randolph, Bernie Lubell, Duncan Miller, Gregory Odle, Laurie Spiegel, Rich Gold, Bob O'Reilly, Michael Solway, Carl Solway

See also text **Essay in Lieu of a Sonata** (1993) → 219



Ich auch Berlin(er)



The phonograph and the photograph have a coeval history of influence and development. The *Edison Effect* players demonstrate the photographic nature of acoustic recordings. These pinhole (or needlepoint?) pictures of sounds long vanished project the shadows of sounds. Holograms, gamma rays, goldfish and cuneiform serve to emphasize the parallel narrative of the mechanization of image and sonic inscription.

Speisen gleichzeitig auf dem Tisch liegen und die Abfolge nach eigenem Gusto bestimmt wird. Das Geräuschchaos der Plattenoberfläche verbindet sich mit den in die Rille geschnittenen Klängen zu einer wilden Mischung aus falsch gedeuteten Intentionen und glücklichen Zufällen.

Der Phonograph und die Fotografie besitzen eine parallel verlaufende Entwicklungs- und Einflussgeschichte. Die Abspielgeräte in *The Edison Effect* verweisen auf den Fotocharakter akustischer Aufnahmen. Diese Lochblendenbilder (oder sind sie doch mit der Nadel erzeugt?) lang verhallter Klänge werfen akustische Schatten. Hologramme, Gammastrahlen, Goldfische und Keilschrift unterstreichen, dass die Mechanisierung des Bildes und der Schallaufzeichnung Hand in Hand verlief.

Al and Mary do the Waltz →126, 135

The Edison Effect 1989

A turn-of-the-century Edison wax cylinder of Strauss' »Blue Danube Waltz« is turned on a paint roller rotated by a motor and rubber band. A laser beam is focused on the groove of the cylinder and its reflections are translated into sound. The laser beam passes through a bowl of goldfish who occasionally interrupt the beam to produce uncomposed musical pauses.

Ein um die Jahrhundertwende entstandener Wachszylinder von Strauss' Donauwalzer aus dem Hause Edison wurde auf eine motorbetriebene Farbwalze übertragen. Auf die Rille ist ein Laserstrahl gerichtet, dessen Reflexionen in Klänge übersetzt werden. Der Laserstrahl durchquert dabei ein Glas mit Goldfischen, von denen er hin und wieder unterbrochen wird, so dass nicht komponierte musikalische Pausen entstehen.

Loving/Dying — the Unrequited Quark →133

The Edison Effect 1990

A 78 rpm record of the »Liebestod« from Wagner's *Tristan & Isolde* is played by laser. The stepping motor which advances the beam along the groove is controlled by the pulses from a geiger counter. With background radiation the music progresses very slowly, resulting in big sustained Wagnerian chords. As a piece of radioactive material (the only real source of time) is uncovered, the music achieves its normal rate of progression, resulting in a recognizable version of the »Liebestod«.

Eine 78 rpm Schallplatte mit dem »Liebestod« aus Wagners *Tristan und Isolde* wird per Laser abgespielt. Der Motor, der den Laserstrahl über die Plattenrillen fortbewegt, wird vom Ticken eines Geigerzählers gesteuert. Bei normaler Hintergrundstrahlung wird die Musik sehr langsam abgespielt, was massive, in die Länge gezogene Wagnerakkorde ergibt. Wird ein Stück radioaktiven Materials (die einzig wahre Zeitquelle) freigesetzt, geht die Musik ins richtige Tempo über und ergibt eine erkennbare Version von »Liebestod«.

Ich auch Berlin(er)

The Edison Effect 1990

A tribute to the Berlin(er) brothers, Emil, Irving, and John Fitzgerald. A gelatin dichromate hologram of a 78 rpm record of the »Beer Barrel Polka« is rotated on a transparent turntable and played by a green laser. Once I realized that only light reflections were needed to make the recorded grooves audible, it became apparent that a hologram (the memory of light reflecting from a surface) would suffice to play music. Here, sans needle, sans groove, the band plays on.

Eine Hommage an die Berlin(er)-Brüder Emil, Irving und John Fitzgerald. Auf einem transparenten Plattenteller läuft ein Dichromatgelatine-Hologramm einer 78 rpm Schallplatte der Polka »Rosamunde«* und wird mit einem grünen Laser abgetastet. Nachdem ich erkannt hatte, dass Tonrillen über bloße Lichtreflexionen hörbar gemacht werden können, wurde mir klar, dass schon ein Hologramm (die Speicherung des von einer Oberfläche reflektierten Lichts) genügt, um Musik abzuspielen. Ohne Nadel, ohne Spur spielt die Kapelle hier immer weiter.

Fragments of Jericho →131

The Edison Effect 1991

An authentic recreation of what is probably the world's most ancient audio recording. A clay cylinder inscribed (by intention or accident?) with voices from the past. By gently turning a large black knob, you can direct the laser beam across the surface of the turning clay vessel to eavesdrop on vibrations from another age.

Eine authentische Rekonstruktion der wohl ältesten Audio-Aufnahme der Welt: eine Keramikwalze mit (bewusst oder zufällig?) gespeicherten Stimmen aus der Vergangenheit. Mit einem großen schwarzen Drehknopf kann man einen Laserstrahl über das kreisende Tongefäß bewegen, um Schwingungen aus einem anderen Zeitalter aufzufangen.

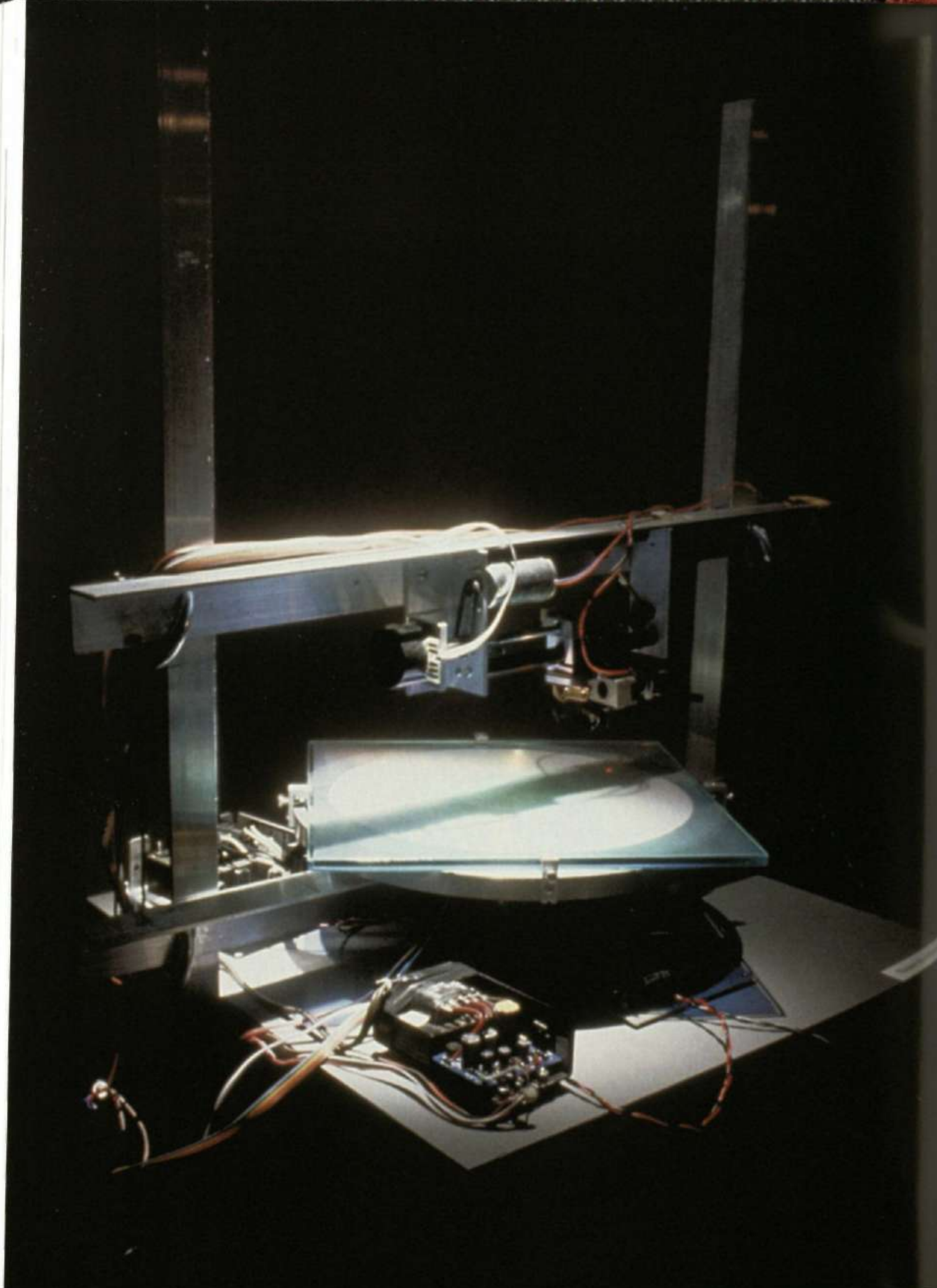
Unraveled Melody →130

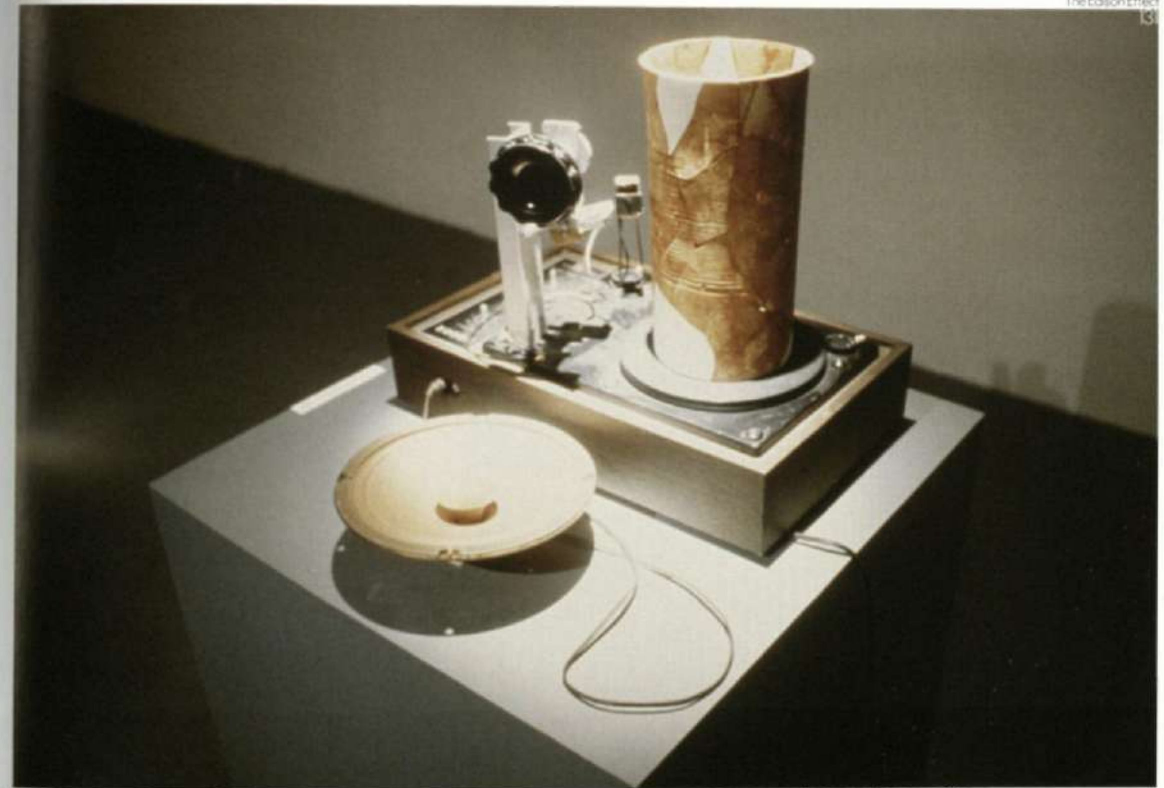
The Edison Effect 1992

Mechanical recording exerted its effects upon music composition by coercing preexisting rondo forms into ever tighter spirals. A hologram of Ravel's »Bolero« cycles forever, as the laser beam weaves its path along the dance floor.

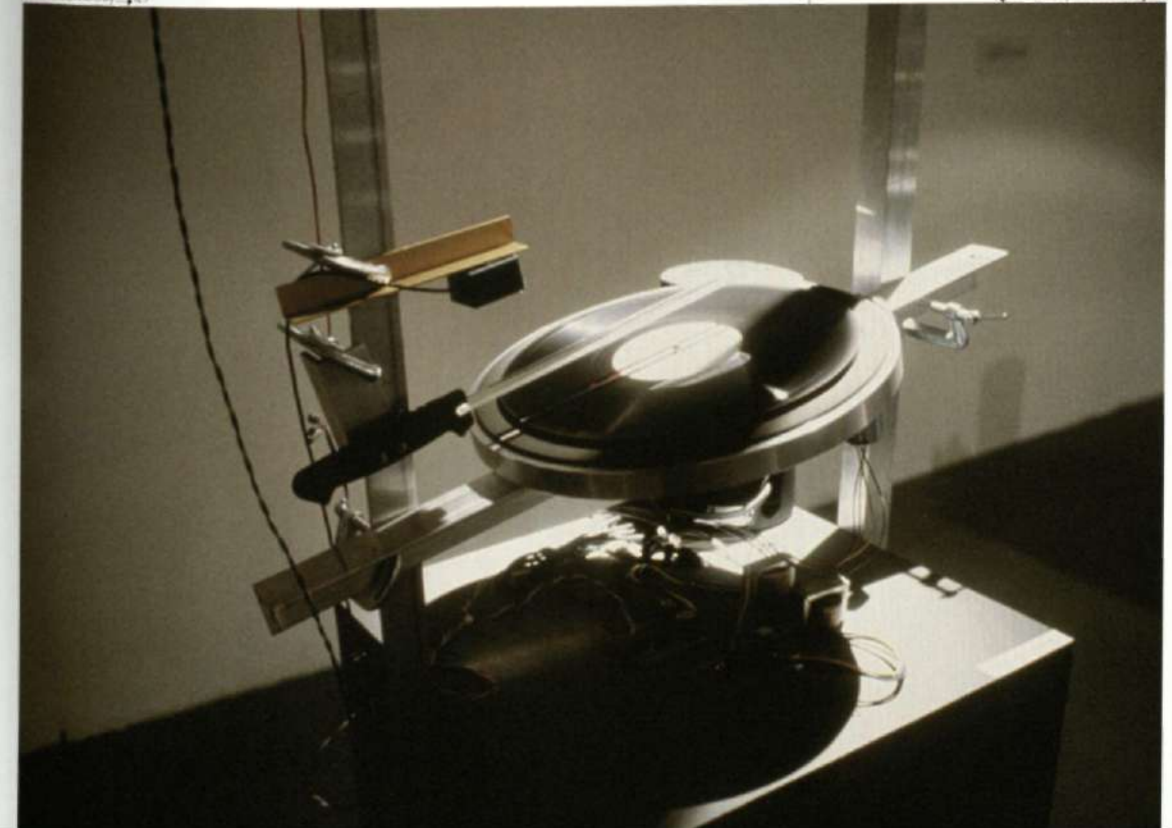
Die mechanische Reproduktion wirkte sich auch auf die Kompositionsweise aus, indem sie etwa existierende Rondoformen in immer engere Spiralen zwang. Ein Hologramm von Ravels »Bolero« dreht sich für immer im Kreis, während sich der Laserstrahl den Weg über die Tanzfläche bahnt.

*Anm d. Übers.: Der Autor scheint hier der Meinung gewesen zu sein, dass die Rechte für »Rosamunde« beim Irving Berlin Estate lagen.





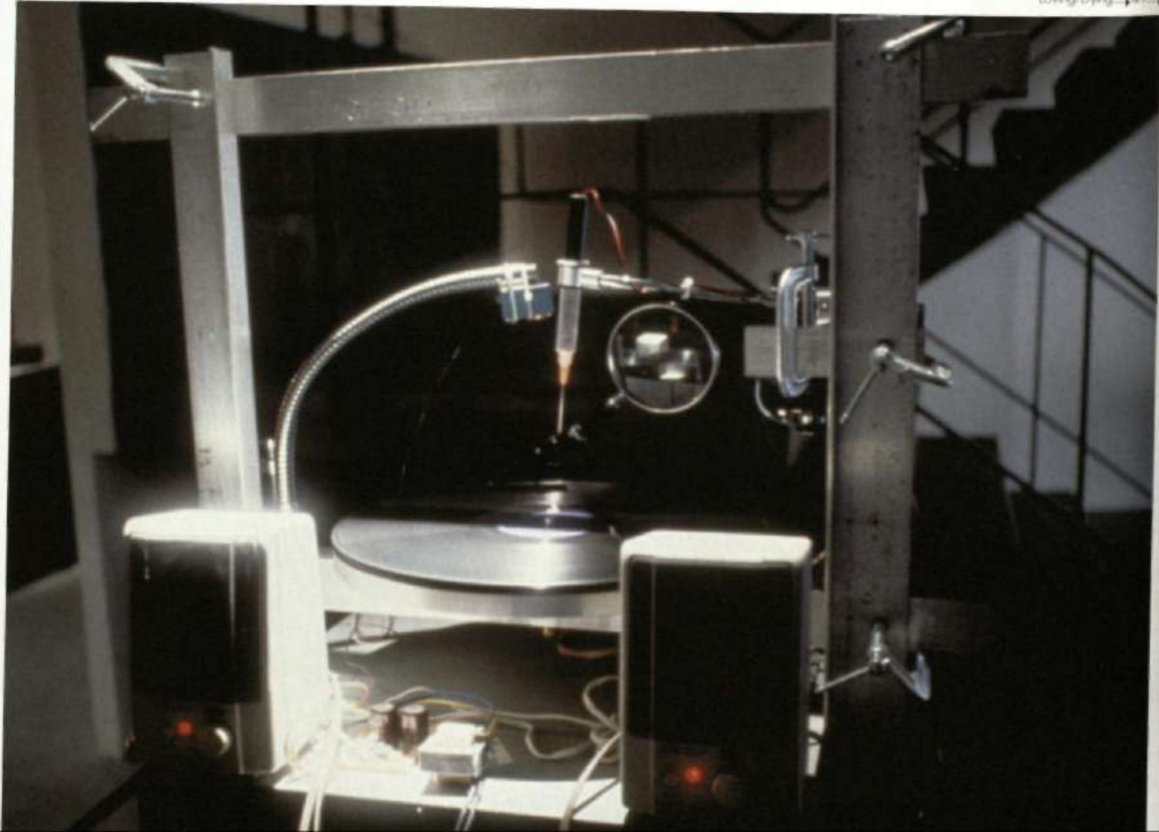
← Unraveled Melody → 129
↑ Fragments of Jericho → 129
↓ Murder by Television → 135





Rondo in Blew à la Cold Turkey → 135

Loving/Dying → 129 →

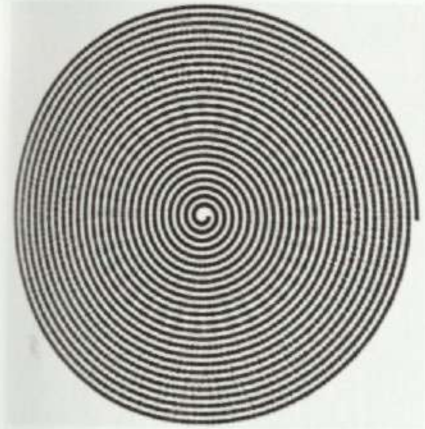


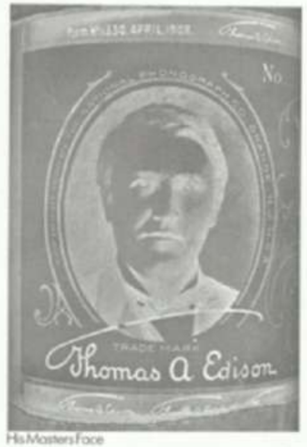






Dinner at Ernie's





His Masters Face



Al and Mary do the Waltz →129

Murder by Television →131

The Edison Effect 1993

Archimedes, Da Vinci, Guillotine, Edison, Teller — the list goes on. Artist-inventors and boy-mechanics through the ages have turned their talents to high tech murder and low-brow entertainment. The light from a TV set directs the laser's glance across »The William Tell Overture« as played by the Edison Orchestra — who's that masked man, anyway?

Archimedes, Da Vinci, Guillotine, Edison, Teller und, und, und. Künstler-Erfinder und forschende Amateure aller Zeiten haben ihr Talent stets auch für Hightech-Mord und triviale Unterhaltung eingesetzt. Das Licht von einem Fernseher lenkt den Laserstrahl über die »Wilhelm Tell Ouvertüre« — gespielt vom Edison-Orchester. Und überhaupt: »Wer war der maskierte Mann?«*

Rhondo in Blew à la Cold Turkey →132

The Edison Effect 1993

A 78 of »Rhapsody in Blue« is erratically scanned by a laser beam emitting from a hypodermic syringe. We may contemplate the addictive act of record listening as Oscar Levant plays himself playing Gershwin in another tired remake of »An American [Junkie] in Paris«.

Eine 78 rpm Platte mit der »Rhapsody in Blue« wird erratisch von einem aus einer Injektionsnadel kommenden Laserstrahl abgetastet. Vielleicht denkt man über den Suchtaspekt des Plattenhörens nach, während Oscar Levant in einem weiteren flauen Remake von »Ein Amerikan[isch]er [Junkie] in Paris« sich selbst beim Gershwin-Spielen spielt.

An Expanded Universe

The Edison Effect 1993

Among the cultural artifacts ejected into deep space by NASA on the Voyager satellite was a solid gold phonograph record containing excerpts of various world musics. The only selection by a living composer was by Laurie Spiegel. Her classic LP, »The Expanding Universe,« is replayed with the beam of a flashlight. It is possible that we hear it now as it will someday sound to some seven-year-old Edison on a planet many miles and years away.

Unter den kulturellen Artefakten, die die NASA mit der Voyager-Sonde ins All schoss, befand sich eine Schallplatte aus solidem Gold mit Auszügen diverser Weltmusiken. Das einzige Stück eines lebenden Komponisten stammte von Laurie Spiegel. Ihre klassische LP »The Expanding Universe« wird mit einer Taschenlampe abgespielt. Wir hören sie damit vielleicht so, wie sie sich eines Tages für irgendeinen siebenjährigen Edison auf einem weit entfernten Planeten anhört.

His Master's Face

The Edison Effect 1993

A projected black and white image of Edison's face that changes between positive and negative depending on the viewer's position on the gallery floor.

Ein projiziertes Schwarzweißbild von Edisons Gesicht, das je nach Betrachterposition zwischen Positiv- und Negativbild changiert.

Dinner at Ernie's

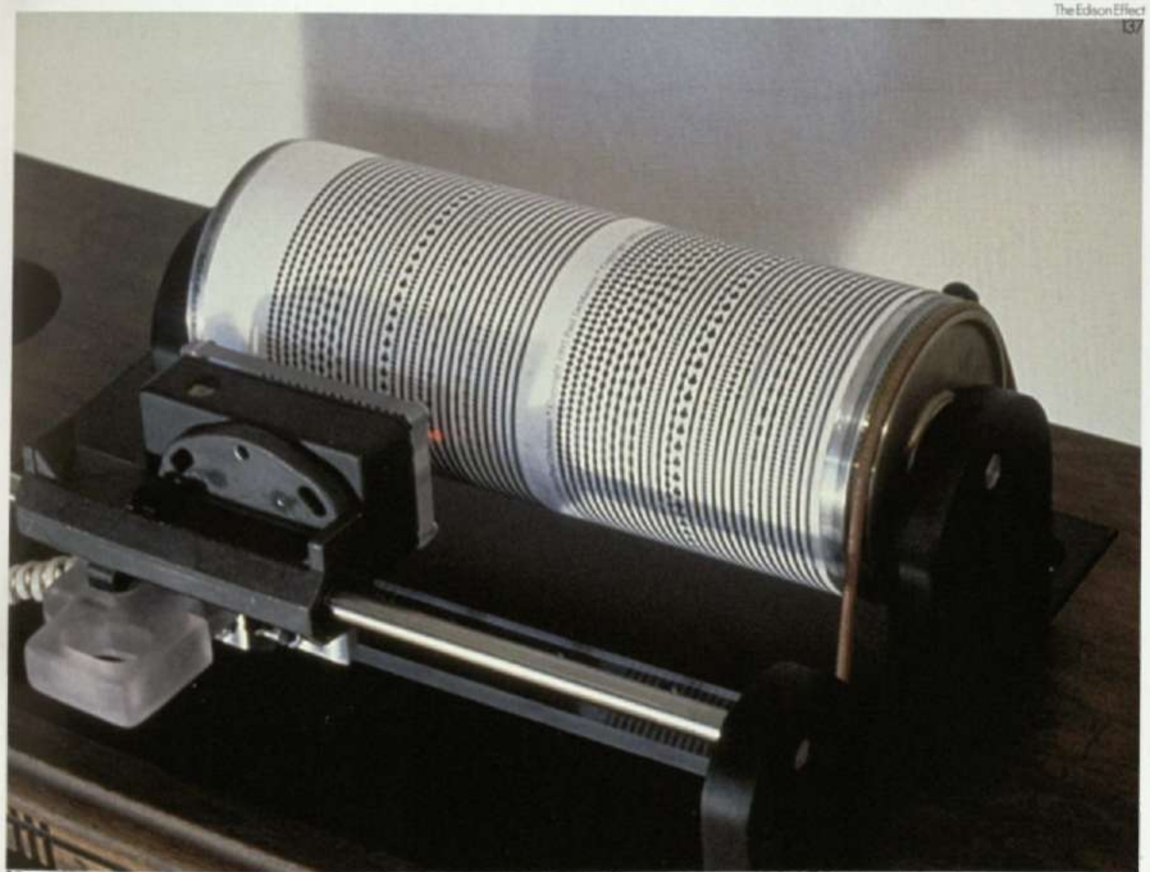
The Edison Effect 1995

Hypnosis, psychosis and gourmet sexual obsession — Hitchcock-energy. Four spinning dinner plates decorated with spiraling movie soundtracks are played by scanning laser beams. Each carries one musical theme from Bernard Herrmann's score for *Vertigo*, the tale of obsessive delusion. Jimmy Stewart and Kim Novak turn 'round & 'round the table at Ernie's restaurant.

Hypnose, Psychose und sexuelle Obsession für Gourmets — Hitchcock-Energie. Vier spiralförmig mit Film-Soundtracks bedruckte rotierende Essteller werden per Laser abgespielt. Auf jedem davon befindet sich ein Motiv aus Bernard Herrmanns Filmmusik für *Vertigo*, der Geschichte einer obsessiven Verblendung. Jimmy Stewart und Kim Novak, wie sie immer wieder den Tisch in Ernie's Restaurant umkreisen.

*Anm. d. Übers.: Anspielung auf die U.S.-Radio- und Fernsehserie *The Lone Ranger* mit ihrem maskierten Helden und ihrer Titelmusik, der Wilhelm-Tell-Ouvertüre.





← Singer of Songs

The Lecture of Comrade Stalin →[138]

The Edison Effect 1995

One side of a 1936 recording of Josef Stalin was digitized, digitally modified and cut back onto a lacquer record, in such a way that, when viewed obliquely, the face of Stalin is visible in the grooves of the record, written by his own voice, so to speak. See also *The Lecture of Comrade Stalin*… installation (1998) and *The Lecture of Comrade Stalin*… performance work (1996).

Eine Seite einer Plattenaufnahme von Josef Stalin aus dem Jahr 1936 wurde digitalisiert, bearbeitet und wieder zurück in eine Lackplatte geschnitten, und zwar so, dass darin von der Seite betrachtet das Gesicht Stalins sichtbar wird — quasi mit der eigenen Stimme geschrieben. Siehe auch die gleichnamige Installation (1998) und Performance (1996).

A Flaw in the Décor →[139]

The Edison Effect 1996

A wooden bee-hive record player and record index holds a number of 12-inch custom records cut in beeswax. Scanned with a laser, this softest of recordable materials reproduces the sounds engraved on their surfaces as it replays the aromas of the flowers the bees have visited.

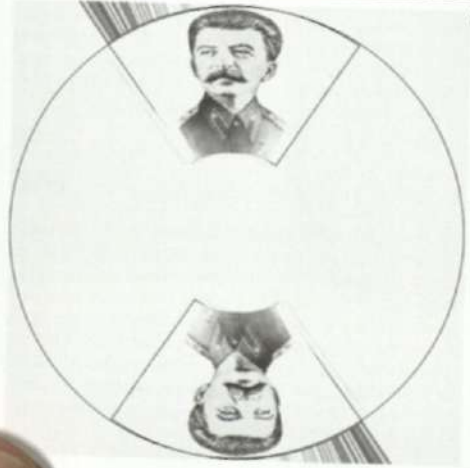
Ein bienenstockartiger hölzerner Plattenspieler samt Plattenschrank mit einer Reihe von in Bienenwachs geschnittenen speziell gefertigten 12-Zoll-Platten. Per Laser abgespielt gibt dieses weichste aller Trägermaterialien die eingeschnittenen Klänge mitsamt den in ihm gespeicherten Aromen der von den Bienen aufgesuchten Blumen wieder.

Singer of Songs

The Edison Effect 1996

Commissioned for a textile show in Switzerland. Postscript (the laser printer language) was used to transform an audio file into a graphical representation that was woven into fine grain textile. The belt of textile is rotated on a printer drum, powered by an ancient Singer treadle sewing machine. The user can pedal faster or slower to vary the pitch/speed, and move a laser/photo pickup to select different tracks. Among the sounds are car crashes, clips of Elvis and xylophone scales.

Auftragsarbeit für eine Textilausstellung in der Schweiz. Mit der Laserdruckersprache Postscript in Grafiken umgewandelte Audiodateien wurden zu einem feinmaschigen Gewebe verarbeitet. Die so entstandene Stoffbahn wird auf einer Druckerwalze mit einer pedalbetriebenen Singer-Nähmaschine in Rotation versetzt. Der Benutzer kann mit dem Pedal die Tonhöhe bzw. Abspielgeschwindigkeit steuern, und mit dem Laser- bzw. Fototonabnehmer verschiedene Tracks anwählen. Das Klangangebot umfasst Verkehrsunfälle, Elvis-Clips und Xylofonskalen.



The Lecture of Comrade Stalin → 137

A Flow in the Décor → 137









A Dry Rain Peddling

in collaboration with Bernie Lubell* Installation 1993

A virtual metaphor of touchstone and tempest – an exploration of chaotic sound from handrails to rainmaking. Eine virtuelle Metapher für Prüfstein und Sturm – eine Erkundung chaotischer Klänge von Handläufen bis zum Regenmachen.

We began the collaboration with an interest in a possible connection between the structures of chaos theory and patterns of naturally occurring sounds. Our first efforts, directed toward building a »chaotic metronome« to tap out irregular and naturally evolving rhythmic patterns, met with little success. It then happened that one of us had a dream in which the image of a »chaotic jump rope« appeared. This two motor device incorporates the basic feature of chaotic dynamical systems, being both damped and driven. Relying on feedback to constrain divergent tendencies of movement, the motors chase each other in a restless pattern of circular accelerations. By attaching headphones to the windings of the two motors, we found that we could eavesdrop on this chaotic conversation. These simple devices have become the »Chaotic Handrails« on the stairway.

Simple chaotic systems (like our handrails) are capable of quite complex behaviors, which is why current models of chaos are employed to describe manifold natural phenomena. These models usually take as their point of departure some system which is basically mathematical or electronic in origin. Our already simple approach using motors and wires led us to speculate on what might happen if the motors were replaced by people on bicycles and the feedback path replaced by interrupting clutches. This mechanical analogy precipitated our awareness of the inherent connection of chaos to time. Divergent and unpredictable, chaos is the »reason« for time's arrow (i.e. its direction). The accumulated accidents that constitute memory, play and innovation permit us to evolve a world in the midst of the restless kinetic wanderings of particles science describes.

Playing with the percussive possibilities of the jump rope suggested to us the sound of rain tapping on the roof and brought to mind The Weather — a classic example of a chaotic system in which the cumulation of tiny forces (e.g. the beating of a moth's wings) can affect the course of the typhoons and tempests our memories recall. Just as the order within chaos appears as patterns of trajectories in phase space, so the present installation traces overlapping journeys through time and association. Participation is the requisite of results. Our interactive analogy permits viewers to inhabit time and to construct surprise.

Am Anfang unserer Zusammenarbeit stand das Interesse an einer möglichen Verbindung zwischen Strukturen der Chaostheorie und Naturklangmustern. Unsere ersten Versuche, die auf die Konstruktion eines »chaotischen Metronoms« zielten, mit dem wir unregelmäßige, natürlich entstehende rhythmische Muster erzeugen wollten, waren von keinem großen Erfolg gekrönt. Dann hatte einer von uns einen Traum, im dem ein »chaotisches Sprungseil« vorkam. Dieses von zwei Motoren betriebene Objekt weist ein Grundmerkmal chaotischer dynamischer Systeme auf: es wird gleichzeitig gedrosselt und beschleunigt. Über Rückkopplung werden gegensätzliche Bewegungstendenzen der Motoren verstärkt, so dass sie sich in einem rastlosen Muster von Beschleunigungen gegenseitig jagen. Durch das Anschließen von Kopfhörern an die Wicklungen der beiden Motoren konnten wir diesen chaotischen Dialog belauschen. Aus dieser einfachen Vorrichtung entstanden schließlich die »chaotischen Handläufe« im Treppenhaus.

Einfache chaotische Systeme (wie unsere Handläufe) können ziemlich vielschichtige Verhaltensweisen an den Tag legen, weshalb zeitgenössische Chaosmodelle auch zur Beschreibung komplexer Naturerscheinungen herangezogen werden. Solche Modelle beruhen meist auf einem letztlich mathematischen oder elektronischen System. Unser einfacher Ansatz mit den Motoren und Seilen führte uns zur Überlegung, was wohl passieren würde, wenn wir die Motoren durch Menschen auf Fahrrädern und den Rückkopplungsweg durch unterbrechende Kupplungen ersetzten. Über diese mechanische Analogie gelangten wir zur Erkenntnis einer grundlegenden Verbindung von Chaos und Zeit. Divergent und unvorhersehbar wie es ist, bildet das Chaos den »Grund« für den Zeitpfeil (d.h. die Richtung der Zeit). Die gesammelten Zufälle, die Gedächtnis, Spiel und Innovation ausmachen, ermöglichen uns, inmitten der rastlosen Partikelbewegungen, welche die Wissenschaft beschreibt, eine Welt entstehen zu lassen.

Beim Spiel mit den perkussiven Möglichkeiten des Sprungseils entstanden Klänge, die an Regentropfen auf einem Dach erinnerten; und das führte uns zum Wetter, dem klassischen Beispiel eines chaotischen Systems, in dem die Häufung winzigster Kräfte (der Flügelschlag eines Schmetterlings) den Verlauf der Taifune und Stürme beeinflussen kann, die den Inhalt unserer Erinnerung bilden. So wie die Ordnung im Chaos in Mustern von Kurven im Phasenraum zutage tritt, so spürt diese Installation den sich überlappenden Reisen durch Zeit und Assoziation nach. Voraussetzung für Ergebnisse ist die Teilnahme. Mit unserer interaktiven Analogie können Besucher sich mitten in die Zeit begeben und die Überraschung konstruieren.

*Bernie Lubell's (*1947) interactive installations have evolved from his studies in both psychology and engineering. As participants play with his whimsical wood machines, they become actors in a theater of their own imagining. Lubell's work includes a stone age digital computer, a phone booth-confessional network, a mechanism for intimacy, room sized simulations of the human heart, brain and breathing and now a giant cooperative knitting machine.

Die interaktiven Installationen von Bernie Lubell (*1947) entwickelten sich aus seinem Doppelstudium der Psychologie und des Maschinenbaus. Beim Spiel mit seinen wundersamen Holzmaschinen werden die Benutzer zu Schauspielern in einem der eigenen Fantasie entspringenden Theater. Lubells Arbeiten umfassen u.a. einen digitalen Steinzeitcomputer, ein Telefonzellen-Beichtstuhlnetzwerk, einen Intimitätsmechanismus, zimmergroße Simulationen des menschlichen Herzens, Hirns und Atem-apparats sowie neuerdings auch eine kooperative Strickmaschine.

Exhibited at:	Intersection for the Arts, San Francisco, CA / US May – June 1993
Thanks to:	New Langton Arts and The National Endowment for the Arts for support to this collaborative project

Dimensions:	10 x 24 x 30 feet
Materials:	wood, metal, electronics, motors, rubber







Chaotic Jump Ropes

Installation 1994

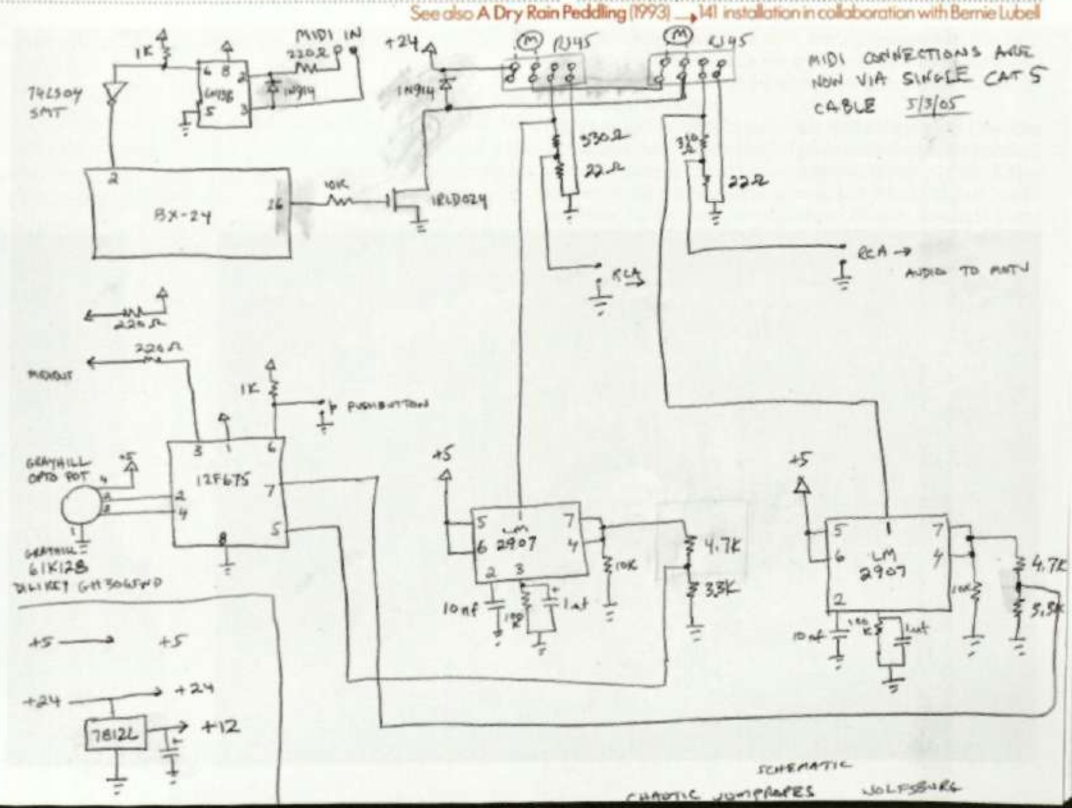
Bright vibrating cords and motors comprise a dynamic system that moves between order and chaos. Tracked by computers, these motions are translated into musical sounds allowing interactive exploration of chaos as sight, sound and touch. Internet access provides online control of the chaotic systems. Bunte schwingende Seile bilden mit Motoren ein dynamisches System zwischen Ordnung und Chaos. Seine von Computern erfassten Bewegungen werden in Klänge übersetzt, so dass das System eine interaktive Erkundung des Chaos auf visueller, akustischer und taktiler Ebene erlaubt. Über das Internet kann das chaotische System auch online beeinflusst werden.

A flexible rope is spun by two motors, one on each end. The motors are connected together in an electronic feedback circuit so that the whole system becomes unstable. By varying the energy (electrical current) into the system or by adding & subtracting small amounts of kinetic energy (by touching the rope) the system can become orderly or chaotic in its behavior, and thus in its visual appearance. The motors are fitted with sensors (electronic tachometers) that send instantaneous speed information to a dedicated microprocessor. A computer algorithm interprets the motor data to detect the degree of orderly/disorderly motion in the rope. These quantities are rendered as musical variations, so that the performer can interactively play the music by touching the rope.

Ein loses Seil wird von zwei an den Enden angebrachten Motoren gedreht. Die beiden Motoren sind über eine elektronische Rückkopplungsschleife miteinander verbunden, so dass ein instabiles Gesamtsystem entsteht. Durch Veränderung der Stromzufuhr bzw. durch Zu- oder Abfuhr kinetischer Energie (mittels Berührung des Seils) kann das System seinen Ordnungsgrad und damit sein Erscheinungsbild ändern. Die Motoren sind mit Sensoren (elektronischen Tachometern) ausgestattet, die Geschwindigkeitsinformationen an einen eigenen Mikroprozessor senden. Ein Computer-Algorithmus errechnet aus den Motordaten den jeweiligen Ordnungsgrad der Seilbewegung. Diese Quantitäten werden in musikalische Variationen umgesetzt, so dass man durch die Berührung des Seils auch die Musik interaktiv beeinflussen kann.

Exhibited at:	Narodni Technicke Muzeum, Prague, CZ	November 1994	Dimensions:	variable
	Park Tower Hall, Tokyo, JP	March – April 1995	Materials:	motors,
	Obscure, Québec, CA	September – October 1995		latex tubing,
	ASU Computing Commons, Tempe, AZ /US	April 1997		microprocessors,
	ICC Gallery, Tokyo, JP	August – September 1997		Max/MSP,
	Phaeno, Wolfsburg, DE	Permanent collection, 2005		midi controlled synthesizers,
Thanks to:	Yoko Hayashi, Itsuo Sakane, Joe Ansel, Michael Solway			audio

See also **A Dry Rain Peddling** (1993) → 141 installation in collaboration with Bernie Lubell









Gray Matter

Installation 1995

Interactive electrified objects that produce sound and sensation when stroked with the hand. Based on the inventions of Elisha Gray, the man who almost invented the telephone but created a musical bathtub instead. Interaktive elektrisch geladene Objekte, die Klänge und Tastempfindungen hervorrufen, wenn man sie mit der Hand berührt. Die Arbeit basiert auf den Erfindungen von Elisha Gray, dem Mann, der fast als Erfinder des Telefons in die Geschichte eingegangen wäre und stattdessen die musikalische Badewanne erfand.

Gray Matter is based on the communication devices of Elisha Gray, a 19th century inventor who is primarily remembered today as the man who almost invented the telephone — his patent application reached the patent office five hours after that of the more famous Alexander Graham Bell. His researches, however, had a different source than Bell's, commencing in electrophysiological experiments carried out in the bathroom whereas Bell's had their origins in polite conversations in the parlor and the instruction of the deaf.

»In late January or early February of 1874 [Gray] heard the refrain of the rheotome issuing from his bathroom, where he found his young nephew ›taking shocks‹ to amuse the smaller children. With a vibrating rheotome in the circuit of a primary induction coil, the boy connected one end of the secondary coil to the zinc lining of the bathtub and held the other end in his hand. When the boy's free hand glided along the bathtub lining, it produced a whining sound in tune with the rheotome. Gray tried the effect and found that quick, hard rubbing made the noise even louder than that of the rheotome itself. When he varied the pitch of the rheotome, the noise followed suit.«*

This was, in effect, the first loudspeaker — a device that could transform electrical vibrations into sound vibrations. By some obscure and little studied phenomenon, a vibrating electrical field seems to modulate the coefficient of friction of human skin, so that when we bow across an electrified surface with our fingers, we excite mechanical vibrations.

The installation consists of a number of disparate objects, tied together by gleaming gold strings, that act as acoustic resonators for sounds that are produced by the interaction of metal surfaces, electrical currents and human flesh. The configurations of musically related objects and domestic appliances serve as a sort of *Gradus ad Parnassum* for achieving music virtuosity at the risk of physical pain. »Stuck and slipped« creates a harp of electrified wires between an old metal toaster and a hollow-core wooden door. By stroking the wires along their length, the viewer can excite Aeolian harp-like sounds. Stroking the wires that connect the ancient zinc bathtub and a ceiling mounted double-bass fiddle of the central piece, »Gray Matter,« draws forth musical scales remi-

Gray Matter beruht auf den Kommunikationsapparaten von Elisha Gray, einem Erfinder aus dem 19. Jahrhundert, der heute vor allem dafür bekannt ist, dass er beinahe das Telefon erfunden hätte — seine Patentanmeldung erfolgte nur fünf Stunden nach der von Alexander Graham Bell. Grays Erfindungen wurden allerdings aus einer anderen Quelle gespeist als die von Bell. Sie gingen von elektrophysiologischen Experimenten im Badezimmer aus, während die von Bell ihren Ursprung in höflicher Salonkonversation und im Gehörlosenunterricht hatten.

»Ende Januar oder Anfang Februar 1874 hörte [Gray] wiederholt das Brummen des Wagnerschen Hammers aus dem Badezimmer dringen, wo sein junger Neffe die kleineren Kinder damit unterhielt, dass er sich ›elektrische Schläge‹ holte. Während der Wagnersche Hammer im Stromkreis der primären Induktionsspule vibrierte, verband der Junge das eine Ende der Sekundärspule mit der Zinkauskleidung der Badewanne und hielt das andere in der Hand. Strich er mit der freien Hand über die Innenseite der Badewanne, gab diese einen auf den Wagnerschen Hammer abgestimmten Heulton von sich. Gray versuchte es selbst und entdeckte, dass dieser bei raschem Reiben das Brummen des Wagnerschen Hammers sogar übertönte. Verstellte er letzteren in der Tonhöhe, veränderte sich auch die der Wanne.«*

Das war de facto der erste Lautsprecher — ein Apparat, der elektrische Schwingungen in Schallschwingungen umwandeln konnte. Aufgrund eines mysteriösen, kaum erforschten Phänomens verändert sich der Reibungskoeffizient der menschlichen Haut in einem schwingenden elektrischen Feld anscheinend so, dass wir mechanische Vibrationen auslösen, wenn wir mit den Fingern über eine Strom führende Oberfläche streichen.

Die Installation besteht aus einer Reihe disparater Objekte, die miteinander durch golden glänzende Saiten verbunden sind. Sie dienen als akustische Resonanzkörper für Klänge, die durch die Interaktion zwischen Metallflächen, elektrischem Strom und menschlichem Fleisch zustande kommen. Die Konfigurationen von musikbezogenen Objekten und Haushaltsgeräten sind eine Art *Gradus ad Parnassum* für die Erlangung musikalischer Virtuosität unter Einsatz körperlichen Schmerzes. »Stuck and Slipped« ist eine Harfe aus Strom führenden Saiten, die zwischen einem alten Metalltoaster und einer hohlen Holztür gespannt sind. Streicht man der Länge nach über diese Saiten, werden äolsharfenähnliche Klänge ausgelöst. Streicht man über die Saiten, die

*Robert V. Bruce, Bell: *Alexander Graham Bell and the Conquest of Solitude*. Ithaca, NY: Cornell University Press 1973, p. 114.

Exhibited at:	Center for the Arts, San Francisco, CA / US	August – September 1995
	Xerox PARC, Palo Alto, CA / US	September 1995
	Obscure, Quebec, CA	September – October 1995
	Bravin Post Lee Gallery, New York, NY / US	January – February 1996
	Sonambiente, Akademie der Künste, Berlin, DE	August – September 1996
	Braunstein Quay Gallery, San Francisco, CA / US	December 1996
	ICC Gallery, Tokyo, JP	August – September 1997
	Galerie Otso, Helsinki, FI	February – March 2000
	Art Center College of Design, Pasadena, CA / US	October 2000 – January 2001
	California State University, Chico, CA / US	February 2002
	CU Art Museum, Boulder, CO / US	September – October 2004
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	September – November 2010

Dimensions:	variable
Materials:	zinc bath tub,
	double bass fiddle,
	brass harpsichord wire,
	violins, washbasins,
	electromagnets,
	hollow-core door,
	toaster, electronics, sound
Thanks to:	Dave Biegelson,
	Renny Pritikin,
	Eiko do Espirito Santo

See also essay **Gray Matter** (1995) → 225

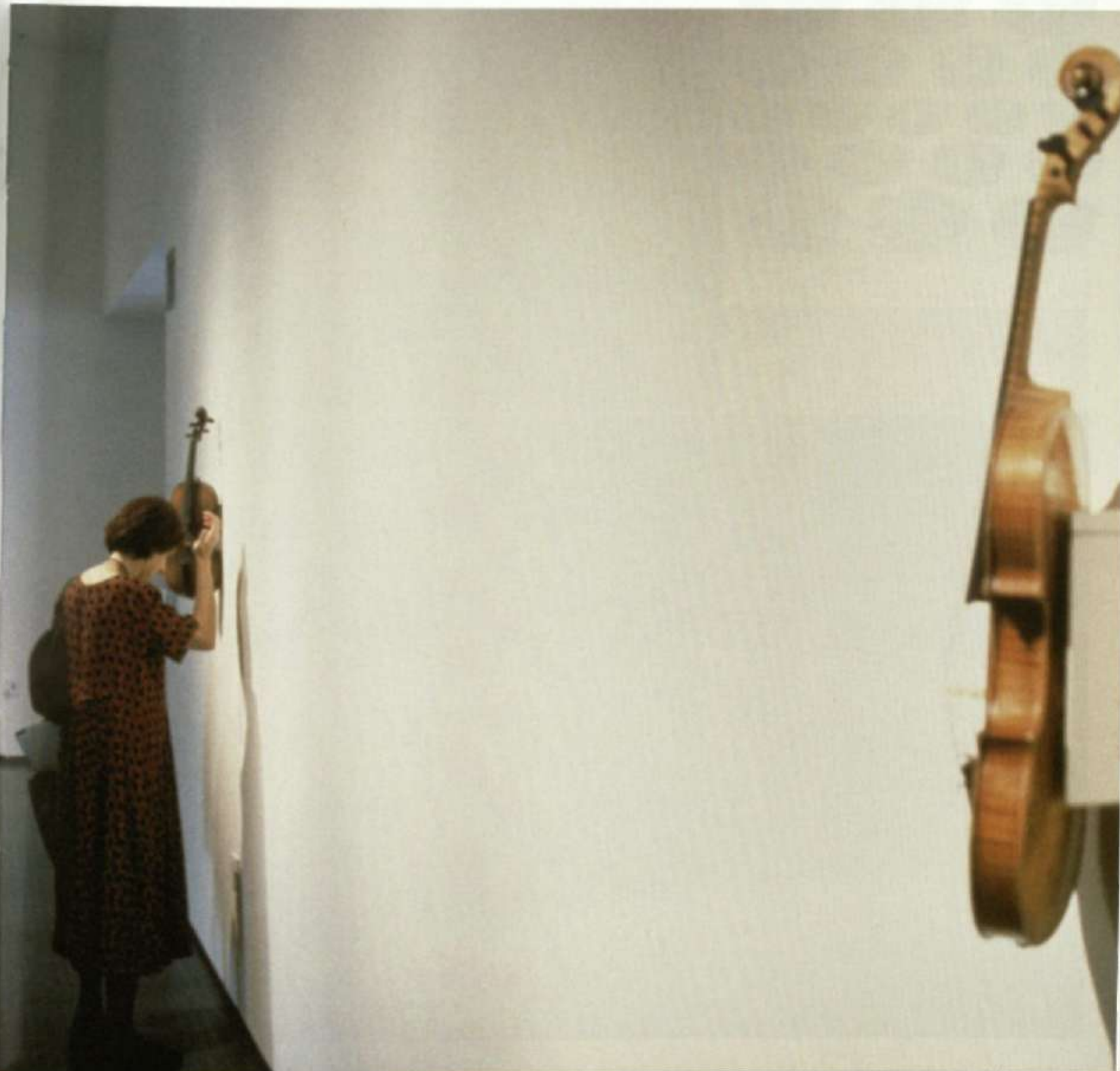


cent of student piano exercises. »Solo for Two« presents two old wooden violins, wall mounted, also connected by harpsichord wires arrayed like the musical staff. Rubbing the back of the hand along the strings draws forth the music of a Bach solo violin partita. The harder the viewer rubs the strings the louder the music. There is also a certain amount of pain involved in the creation of this sweet music, which varies from person to person. In general, tall skinny people seem to experience more pain from the exercise than short fat ones.

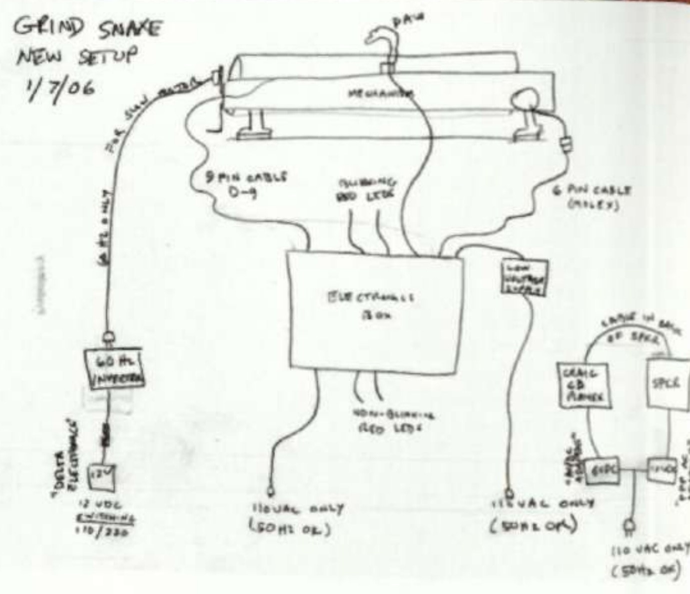
As we stroke the wires, we both feel as texture and hear as sound the faint electrical stirrings within the wire — melodies, scales, creakings and glissandi inhabit a world in which touch and hearing are for a moment unified. This phenomenon may someday find a fit to the structure of our relations — perhaps as electrically definable surface textures, audio communication in a vacuum, or other applications. But for now it languishes, like Elisha Gray, in the backwater of the culturally inappropriate, insignificant and obscure.

in »Gray Matter«, der zentralen Arbeit der Installation, die alte Zink-Badewanne mit dem an der Decke befestigten Kontrabass verbinden, erklingen an Klavieretüden erinnernde musikalische Läufe. »Solo for Two« besteht aus zwei an die Wand montierten Geigen, die ebenfalls mit in Form von Notenlinien angeordneten Cembalosaiten verbunden sind. Reibt man mit dem Handrücken darüber, löst man die Musik einer Bachschen Violin-Partita aus, wobei die Musik umso lauter wird, je stärker man reibt. Die Erzeugung dieser herrlichen Musik ist also mit einem gewissen Schmerz verbunden, der im Übrigen von Person zu Person verschieden ist. Im Allgemeinen scheinen lange hagere Personen mehr Schmerz zu empfinden als kleine dicke.

Beim Über-die-Saiten-Streichen sind die schwachen elektrischen Ströme in ihnen gleichermaßen taktil wie akustisch wahrnehmbar — Melodien, Tonleitern, Knarrgeräusche und Glissandi bevölkern eine Welt, in der Tast- und Hörsinn einen Momentlang eins sind. Vielleicht findet dieses Phänomen ja irgendwann einmal einen Platz im Gefüge unserer sozialen Beziehungen — als elektrisch definierbare Oberflächenstruktur, als akustisches Kommunikationsmittel im Vakuum oder dergleichen —, aber zur Zeit dümpelt es wie Elisha Gray in der Rumpelkammer des kulturell Unangepassten, Bedeutungslosen und Abstrusen vor sich hin.













Grind Snaxe Blind Apes (A Study for Pomeroy's Tomb)

I n s t a l l a t i o n 1997

A room constructed of cardboard storage boxes acts as a light baffle. Inside, a wire cage encloses a mechanized monkey's paw that draws the face of deceased artist Jim Pomeroy in light on a slowly rotating phosphorescent drum, accompanied by the sound of his own snoring. Ein aus Pappkartons gebauter Raum als Dunkelkammer. Darin ein Drahtkäfig, in dem eine mechanische Affenhand das Gesicht des verstorbenen Künstlers Jim Pomeroy mit Licht auf eine langsam rotierende phosphoreszierende Trommel zeichnet, begleitet vom Schnarchgeräusch des Künstlers.

A slow scan video receiver constructed out of a single LED, held in a monkey's paw, draws images in light upon the phosphorescent surface of a slowly rotating drum. The images, multiples of the smiling face of Jim Pomeroy, deceased artist and friend, are already fading before they are complete. Only the constant repetition, refreshing and continuous action of the machine can sustain the illusory memory of the images. The faces are always drawn in multiples, 2,3,4, 5 and back again, each time increasing in number as they decrease in size, machines being capable only of multiplying, not of revivifying. The droning of the computer-controlled motor reinforces the sound of Pomeroy's snoring, recorded for his own 1980 installation, »Ancestral Rotation.«

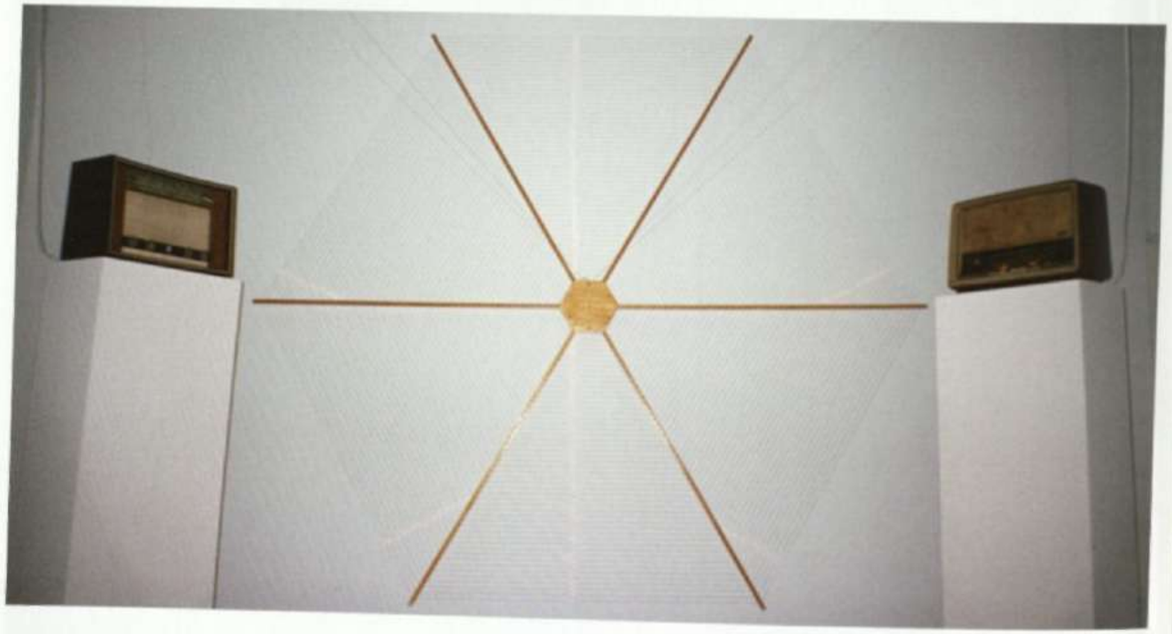
Mit einem aus einer einzigen LED bestehenden Schmalbandvideoempfänger zeichnet eine Affenhand Licht-Bilder in die phosphoreszierende Oberfläche eines langsam rotierenden Zylinders. Die Bilder, Vervielfältigungen des lachenden Gesichts des verstorbenen Künstlers und Freundes Jim Pomeroy, verblassen, bevor sie fertig sind. Lediglich die ständige Wiederholung und Auffrischung und die unablässig laufende Maschine können das trügerische Gedächtnis der Bilder aufrechterhalten. Das Gesicht wird immer in mehreren Exemplaren gezeichnet: 2,3,4,5 in aufsteigender und absteigender Reihenfolge. Je mehr es werden, umso kleiner werden sie; die Maschine kann nur vervielfältigen, nicht wiederbeleben. Das Dröhnen des computergesteuerten Motors verstärkt Pomeroys Schnarchgeräusch, das er 1980 für seine Installation »Ancestral Rotation« aufgenommen hat.

Exhibited at:	San Jose Museum of Art, CA / US	February – May 1997	Dimensions:	variable
	San Francisco Camerawork, CA / US	September – October 1998	Materials:	cardboard boxes,
	Nelson Art Gallery, U.C. Davis, CA / US	Spring 2000		wire mesh, LEDs,
	Art Center, College of Design, Pasadena, CA / US	October 2000 – January 2001		motors, microprocessor,
	transmediale 2006, Akademie der Künste, Berlin, DE	March 2006		phosphorescent paint,
Thanks to:	Jim Pomeroy estate, Fleischhacker Foundation			sound

See also A Byte at the Opera (1976) → 202




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The Lecture of Comrade Stalin

(radiophonic version) Installation 1998

The voices of Joseph Stalin, Elvis Presley, Spike Jones and Lady Macbeth of Mtsensk mingle and converse in the ether and are received and made audible by four ancient shortwave radios. Die Stimmen von Stalin, Elvis Presley, Spike Jones und der Lady Macbeth von Mzensk vermischen und unterhalten sich im Äther und werden von vier alten Röhrenradios empfangen und hörbar gemacht

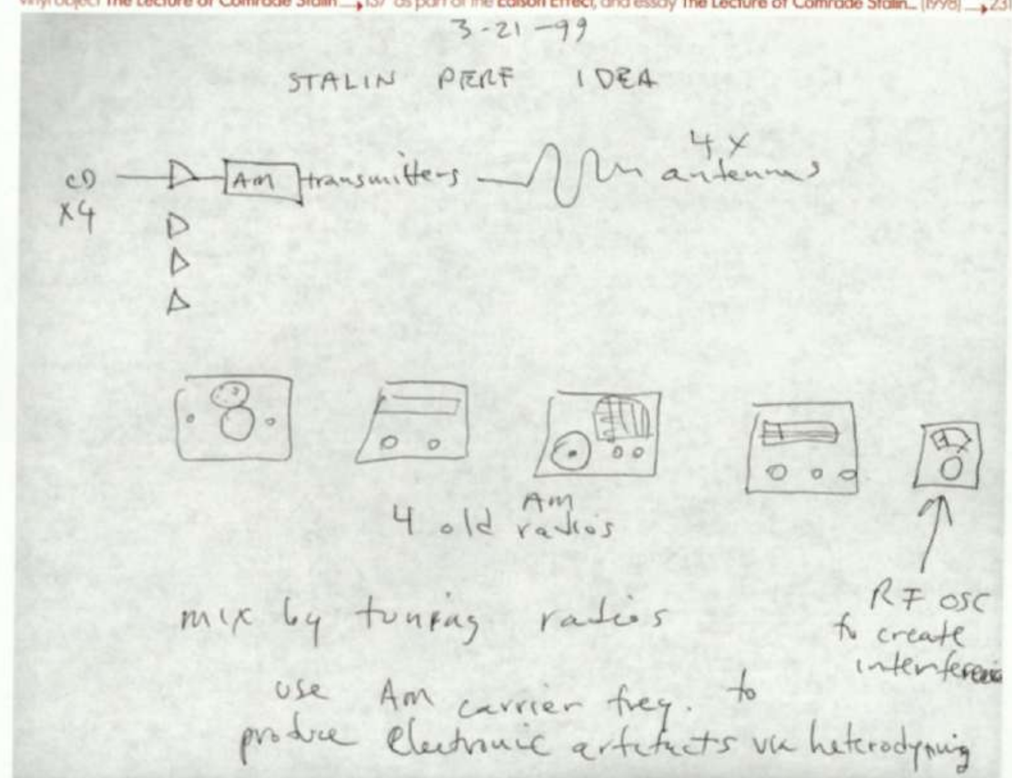
Four old tube radios receive varied mixes of eight tracks of audio mixed in the AM radio spectrum. The radios are fed by antennas that pick up different aspects of the simultaneously transmitted channels via old wooden-frame and magnet-wire antennas.
The form of the antenna, a spider web wrapped around a wooden-spoke armature, is an elaborated form of the directional long wave antennas used in the 1920s. It has the property of canceling out signals arriving from a direction orthogonal to the plane of the coils, and enhancing those arriving from the direction along its plane. Thus, while resembling a »God's Eye« weaving, it is actually anatomically less an eye and more a pair of ears to the ether.
Several overlapping audio channels made from digitally processed samples of speeches by Stalin, of songs by Elvis, of orchestral and operatic works of Shostakovich and Spike Jones are transmitted in the space of the installation in such a way that they mix in the ether and the resultant radio frequency mix is picked up and played by the radios. Each of the four radios has a different »view« of the same audio material.

Vier alte Röhrenradios empfangen verschiedene Mischungen von acht im Kurz- bis Langwellenbereich gemixten Audiokanälen. Die Radios werden von Antennen gespeist, die verschiedene Teile der simultan ausgestrahlten Kanäle auffangen: alten magnetischen Rahmen- bzw. Drahtantennen. Die Form der Antenne, ein spinnennetzförmig um Holzspeichen gewickelter Draht, ist eine verbesserte Form der in den 1920er Jahren benutzten Langwellen-Richtantennen. Sie besitzt die Eigenschaft, die im rechten Winkel zur Spulenebene eintreffenden Signale zu schlucken und die parallel zur Spulenebene eintreffenden zu verstärken. Obwohl sie also aussieht wie ein »Auge-Gottes«-Webstück, entspricht sie anatomisch gesehen weniger einem Auge als vielmehr einem Paar Ohren für den Äther.
Mehrere, einander überlagernde Audiokanäle mit digital bearbeiteten Ausschnitten von Stalin-Reden, Elvis-Songs, Orchester- und Opernwerken von Schostakowitsch und Spike Jones werden so in den Installationsraum übertragen, dass sie sich im Äther mischen und der Frequenzmix von den Radios empfangen und wiedergegeben wird. Jedes der vier Radios hat eine andere »Sicht« auf dasselbe Audiomaterial.

Exhibited at:	Ecole d'Art de Aix en Provence, FR	April – May 1999
	Galerie Otso, Helsinki, FI	February – March 2000
	S.F. Arts Commission Gallery, San Francisco, CA / US	May – June 2001
Thanks to:	Paul Panhuysen	

Dimensions:	variable
Materials:	radios, antennas, radio transmitters, sound

See also: performance version The Lecture of Comrade Stalin (1998) → 204 with recorded excerpt on CD Ghosts and Monsters → 266, vinyl object The Lecture of Comrade Stalin → 137 as part of the Edison Effect, and essay The Lecture of Comrade Stalin... (1998) → 231







Galerie Metronom, Barcelona



Braunstein-Quay Gallery S.F.



The Messenger

Installation 1998 revised 2005

Email messages received over the internet are displayed letter by letter on three alphabetic telegraph receivers: a large array of 26 talking washbasins, each intoning a single letter of the alphabet in Spanish; a chorus line of 26 dancing skeletons and a series of 26 electrolytic jars with metal electrodes in the form of the letters A to Z that oscillate and bubble when electricity is passed through them. Über das Internet eingehende E-Mails werden Buchstabe für Buchstabe auf drei alphabetischen Telegrafenempfängern angezeigt: 26 großzügig im Kreis angeordneten Waschschüsseln, die jeweils einen Buchstaben des Alphabets auf Spanisch intonieren, einem corps de ballet aus 26 tanzenden Skeletten und einer Reihe von 26 Glasgefäßen mit einem Elektrolyt und buchstabenförmigen Metallelektroden, die sich verfärben und blubbern, wenn Strom durch sie fließt.

The Messenger is an Internet driven installation based on early proposals for the electrical telegraph, in particular those made by the Catalan scientist Francesc Salvà. It examines the metaphors encoded within technology, especially lost or orphaned technologies and tries to trace their origins, speculating on the way that mechanisms are the repositories of larger unspoken conceptions and dreams. It takes the telegraph as a point of departure from which to examine the relationship between electricity and democracy, and how electrical telecommunication technologies have participated in our solidarity and in our isolation, in our equality and our oppression, in the richness of our experience and the uncertainty of our lives.

Email messages sent from around the world are received by a computer and spelled out, one letter at a time over three fanciful telegraph receivers: A circular array of 26 talking chamber pots speaks out the letters in 26 different voices. Men, women, schoolchildren and aged pensioners are jarred into vocalization when their individual letter is activated. The watery resonance of the metal bowls creates a unique reverb for each voice, disconnecting it from the other voices and from the acoustic space of the gallery. Another receiver is made up of a chorus line of 26 little dancing skeletons. Each wears a tiny poncho emblazoned with a letter of the alphabet. When each letter of a message is activated, the skeleton jumps, producing a *danse macabre* as the email messages roll off the Internet. The third receiver is a line of 26 antique glass jars, each filled with an electrolyte and holding a pair of metal electrodes, one of them shaped like a letter of the alphabet. The electrical currents cause the electrodes to change from shiny metallic to black alternately and to produce hydrogen bubbles. Nowhere does the system possess any memory or understanding of the messages displayed. Unless the signals are observed, written down and interpreted, the installation is the final meaningless terminus for messages that have traveled around the world and died, referring to the lost or meaningless message that has become so frequent an experience in our daily life.

The Messenger ist eine internetgesteuerte Installation, die auf frühen Vorschlägen für elektrische Telegrafen, insbesondere denen des katalanischen Wissenschaftlers Francesc Salvà, beruht. Sie untersucht die in Technologien — vor allem vergessenen und verwaisten Technologien — eingelagerten Metaphern und versucht, deren Herkunft zu ermitteln, sie als Depots unausgesprochener allgemeiner Vorstellungen und Träume zu lesen. Anhand des Telegrafen spürt sie dem Verhältnis von Elektrizität und Demokratie nach und wirft die Frage auf, was elektrische Telekommunikationstechnologien zu unserer Solidarität und Isolation, unserer Gleichheit und Unterdrückung, zum Reichtum unserer Erfahrungen und zur Ungewissheit unseres Lebens beigetragen haben.

Aus aller Welt auf einem Rechner eingehende E-Mails werden über drei bizarre telegrafische Empfangsgeräte Buchstabe für Buchstabe ausgegeben. Der zentrale Empfänger, ein Set von kreisförmig angeordneten sprechenden Schüsseln, gibt die Einzelbuchstaben in 26 unterschiedlichen Stimmen wieder. Männer, Frauen, Schulkinder und Rentner erheben bei Aktivierung des jeweiligen Buchstabens scheppernd ihre Stimme. Der hallige Klang der Blechschüsseln gibt jeder eine eigene Resonanz und hebt sie dadurch von den anderen und vom akustischen Raum des Ausstellungsraums ab. Ein weiterer Empfänger besteht aus einem corps de ballet aus 26 Miniaturskeletten, die alle einen kleinen Poncho mit einem Buchstaben des Alphabets tragen. Wird ein Buchstabe aktiviert, springt das zugehörige Skelett in die Luft, sodass mit dem Eintreffen der E-Mail-Nachrichten aus dem Internet eine Art Totentanz entsteht. Der dritte Empfänger ist eine Reihe von 26 alten Glasgefäßen, die mit einem Elektrolyt gefüllt und mit zwei Elektroden bestückt sind, wovon eine die Form eines Buchstaben besitzt. Je nach Stromzufuhr verfärben sich die Elektroden von metallisch glänzend zu matt schwarz und sondern Wasserstoffbläschen ab. Das System verfügt über keinerlei Speicher oder Verständnis für die übermittelten Botschaften. Sofern die Signale nicht beobachtet, mitgeschrieben oder gedeutet werden, ist die Installation eine sinnentleerte letzte Ruhestätte für Nachrichten, die um die ganze Welt gereist sind, um hier zu verenden. Ein Hinweis auf die verschollene oder sinnlose Botschaft, die heute zu einer so alltäglichen Erfahrung geworden ist.

Exhibited at:	Galerie Metronom, Barcelona, ES	February 1998
	Braunstein-Quay Gallery, San Francisco, CA / US	December 1999 – January 2000
	Galerie Otso, Helsinki, FI	February – March 2000
	Nelson Art Gallery, U.C. Davis, CA / US	Spring 2000
	Art Center College of Design, Pasadena, CA / US	October 2000 – January 2001
	Cantor Arts Center, Stanford University, CA / US	August 2001 – January 2002
	Museum of Science and Industry, Manchester, GB	October 2005 – January 2006
	OK Centrum für Gegenwartskunst, Linz, AT	September – October 2006
	TESLA, Berlin, DE	November 2006
	kim? / RIXC Gallery, Riga, LV	April – June 2010

Winner of the Golden Nica Award at Ars Electronica, Linz, 2006

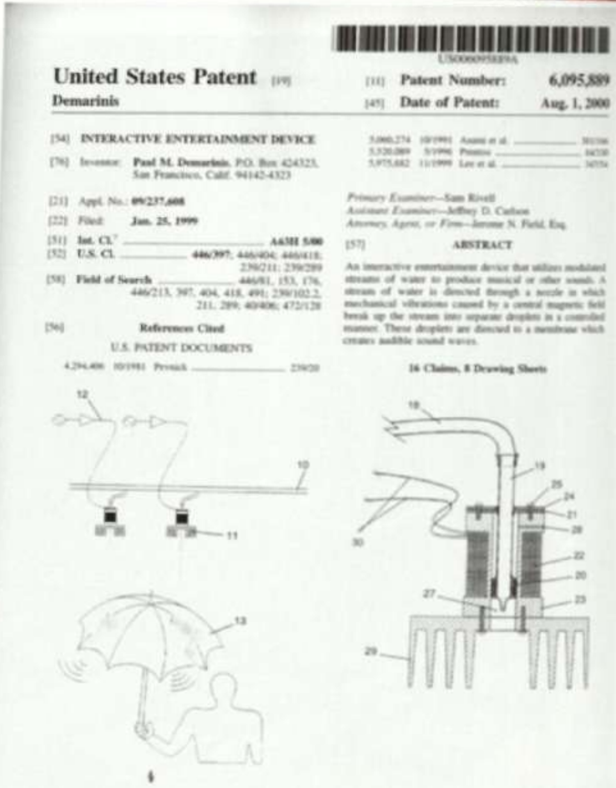
Dimensions:	variable
Materials:	internet,
	computer,
	custom electronics,
	bowls, jars,
	chemicals, wire,
	toy skeletons, cloth,
	wood, sound
Thanks to:	Rafael Tous, Barbara Held,
	Erkki Huhtamo, Andrea Zapp

See also essay The Messenger (1998) → 237








United States Patent [19]
Demarinis

[11] Patent Number: 6,095,889
[45] Date of Patent: Aug. 1, 2000

[54] INTERACTIVE ENTERTAINMENT DEVICE

[76] Inventor: Paul M. Demarinis, P.O. Box 424323, San Francisco, Calif. 94142-4323

[21] Appl. No.: 09/237,608

[22] Filed: Jan. 25, 1999

[56] References Cited

U.S. PATENT DOCUMENTS

[57] ABSTRACT

An interactive entertainment device that utilizes modulated streams of water to produce musical or other sounds. A stream of water is directed through a nozzle in which mechanical vibrations caused by a central magnetic field break up the stream into separate droplets in a controlled manner. These droplets are directed to a membrane which creates audible sound waves.

16 Claims, 8 Drawing Sheets

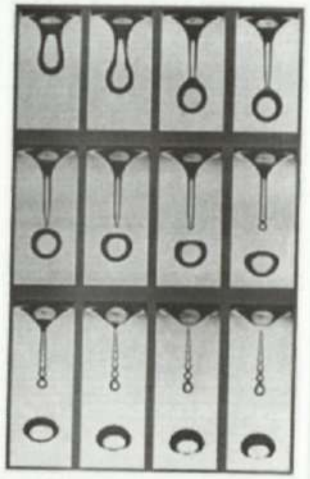


FIG. 6. A sequence of pictures of a water drop falling from a circular plate 1.25 cm in diameter (Shi, Brenner, and Nagel, 1994). The total time elapsed during the whole sequence is about 0.1 s. Reprinted with permission. © American Association for the Advancement of Science.



RainDance

Installation 1998

Twenty falling streams of water, modulated with audio signals, create music and sound when intercepted by visitors' umbrellas. Zwanzig durch Audiosignale modulierte Wasserstrahlen produzieren Musik und Klänge, wenn sie mit Regenschirmen unterbrochen werden.

As early as 1837 the French scientist Felix Savart reported that water jets subjected to the vibrations of tuning forks change their visible form, at times splitting into two streams. Later studies by Chichester Bell and Charles Vernon Boys revealed that vibrations cause the water to separate into a regular patterns of water droplets that repeat the frequency of the vibration. These droplets, when allowed to fall on a resonant surface, can reproduce the sounds of the original source.*

RainDance uses this phenomenon of physics to create an interactive and literally immersive sound environment that people can explore musical water streams with umbrellas. Streams of ordinary water are passed through special nozzles that impose the vibrations of audio frequencies, so that the stream is broken up into a precise number of droplets. When these streams fall on a resonant surface, such as an umbrella, a tone is reproduced. In this way, various familiar melodies can be reproduced.

Bereits 1837 berichtete der französische Wissenschaftler Felix Savart, dass ein Wasserstrahl, wenn er den Schwingungen einer Stimmgabel ausgesetzt wird, seine Form verändert, sich mitunter sogar in zwei Strahlen teilt. Spätere Studien von Chichester Bell und Charles Vernon Boys zeigten, dass Wasserstrahlen von den Schwingungen in ein regelmäßiges, die Schwingungsfrequenz wiederholendes Tropfenmuster zerlegt werden. Fallen diese Tropfen auf einen Resonanzkörper, reproduzieren sie den Klang der ursprünglichen Schwingungsquelle.*

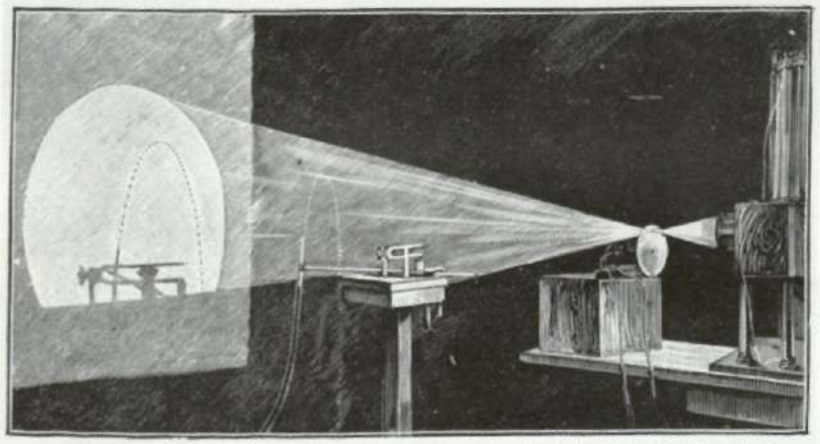
RainDance macht sich dieses physikalische Phänomen zunutze, um ein interaktives, im wahrsten Sinn immersives Sound-Environment zu schaffen, in dem man »musikalische« Wasserstrahlen mit Regenschirmen erforschen kann. Mehrere Strahlen gewöhnlichen Wassers werden durch spezielle Düsen gepresst, wo ihnen die Schwingungen von Audiofrequenzen mitgeteilt werden, so dass sie in eine präzise Anzahl von Tropfen zerfallen. Treffen diese auf eine resonierende Oberfläche wie z.B. einen Regenschirm, entstehen Töne. Auf diese Weise werden eine Reihe vertrauter Melodien wiedergegeben.

* This principle was invoked in 1896 by French writer Alfred Jarry in his neo-scientific novel *The Exploits and Opinions of Dr. Faustroll, Pataphysicist*, in which the Bishop demonstrated a method of pissing in which the resonant droplets of urine create a musical effect.

* Dieses Prinzip griff der französische Schriftsteller Alfred Jary 1896 schon in seinem neo-wissenschaftlichen Roman *Heldentaten und Lehren des Dr. Faustroll (Pataphysiker)* auf; dort führt der Bischof eine Methode des Wasserlassens vor, bei der die Urintropfen mit einem musikalischen Effekt auf einen Resonanzkörper auftreffen.

Exhibited at:	Swatch Pavilion, Expo 1998, Lisbon, PT	May – September 1998
	Art Center, College of Design, Pasadena, CA / US	October 2000 – January 2001
	Ars Electronica, Linz, AT	September 2001
	MicroWave Festival, Hong Kong, HK	November 2002
	Maerz Musik, Berliner Festspiele, Berlin, DE	March 2003
	Festival Archipel, Geneva, CH	March 2004
	Galerie Kapelica, Ljubljana, SI	March 2006
	International Digital Art Festival, Taipei, TW	October – November 2006
	Festival Internacional de Arte, Leon, MX	August – September 2007
	Chants Mechaniques, Lille, FR	October 2007
	Foro Cultural, Leon, MX	January – February 2008
	Zero1 Festival, San Jose, CA / US	May – June 2008
	Höhenrausch, OK Centrum, Linz, AT	May – October 2009
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	July – September 2010
Honorary mention, Ars Electronica, Linz, 2001		

Dimensions:	variable from 20 x 10 x 50 feet
Materials:	custom modulating nozzle (U.S. patent 6,095,889) audio amplifiers, custom circuits, water, umbrellas



Experiment for showing by intermittent light the apparently stationary drops into which a fountain is broken up by the action of a musical sound. (See page 83).







Four Foxhole Radios

Installation 2000

A series of working radios constructed from unlikely materials such as chewing gum wrappers, broken light bulbs and rusty nails offers proof of technology in its absence. Eine Reihe funktionstüchtiger Radios aus Materialien wie Kaugummipapier, kaputten Glühbirnen, rostigen Nägeln usw. zeigen, dass Technologie auch in ihrer Abwesenheit vorhanden ist.

Four Foxhole Radios looks at the basics of transforming the radio waves that inaudibly permeate our environment at all times into audible sounds. The very early history of radio encountered this problem — transforming electrical waves in the ether into audible messages — and created a variety of systems of tuning and detection to accomplish it. Basically a radio consists of an antenna hoisted skyward and a connection to the earth; a tuning system consisting of coils of wire and some sort of capacitor; a detector which rectifies the high frequency waves and generates an electrical audio signal, and a transducer to convert these signals into sound. Much of the experimentation in the early days surrounded these basic elements of radio receivers. In particular, many exotic combinations of minerals, liquids and metals, clockwork motors and magnets were employed as detectors including the most famous, a »cat's whisker« — a thin metal wire lightly grazing a crystal of galena ore. A vast variety of antenna designs were tried including kites, and the design of the tuning elements rivaled even pasta for its plethora of forms. After the invention of the vacuum tube in 1906, radio began to achieve its final form and these early experimental radios disappeared, except for the crystal-sets built by generations of school children to induct them into the culture of technology.

During World War II a number of designs emerged for what came to be termed »foxhole radios« that closely resembled these early radio sets in design and function. The idea was that they could be tinkered together in the field by soldiers who found themselves without real communication equipment, to tune into the radio waves carrying the information that was so vital a part of that war. They depended on a variety of available manufactured parts combined with improvised elements to form a simple but functioning radio receiver. In a sense, they might also be termed »desert island radios« inasmuch as they imply the possibility of both technology and trade far removed from the organized channels of commerce. Like ET's coat-hanger and Speak'n'Spell assemblage-communicator, the foxhole radios served to continue a connection to a point of origin that had been lost. This ritualization of activities and materials for the purpose of achieving interaction with an invisible sphere has been called »cargo cultism« when applied to other cultures. Thus, the foxhole radio served both as a ritual link to the spirit of the tribe and an assemblage-self-portrait of a stranger constructed with the materials in his environment.

In creating my piece *Four Foxhole Radios* I have considered these various features of radios — radios as proof of technology in its absence, radios as channels to the unseen, and radios as portraiture and landscape. It turns out that semiconductors — the central discovery on which our communications culture turns, and among the most exotic products of materials science — are in fact everywhere to be found. I have made junction diodes from burnt out lightbulbs, mesquite barbeque charcoal, rusty batteries and eighteenth century nails; variable and fixed capacitors from packs

Four Foxhole Radios beschäftigt sich mit den Grundlagen der Umwandlung der uns überall umgebenden Radiowellen in akustische Ereignisse. In der Frühgeschichte des Radios stellte dies ein großes Problem dar, zu dessen Lösung man eine ganze Reihe von Empfangs- und Detektionsverfahren erfand. Ein Radio besteht im Grunde aus einer himmelwärts gerichteten Antenne und einer Verbindung zur Erde; einem Schwingkreis aus einer Spule und einem Kondensator; einem Detektor, der die Hochfrequenzwellen gleichrichtet und ein elektrisches Audiosignal erzeugt, und einem Schallwandler, der das elektrische Signal in hörbare Töne umwandelt. Ein Großteil der Experimente in der Frühzeit des Radios drehte sich um diese grundlegenden Elemente. Exotische Kombinationen aus Mineralien, Flüssigkeiten und Metallen, Uhrwerken und Magneten wurden als Detektoren eingesetzt, deren berühmtester wohl der »Katzenbart-Detektor« war, bei dem ein dünner Metalldraht auf einem Galenitkristall aufliegt. Ebenso wurde eine Unmenge von Antennenformen — u.a. auch Drachen — ausprobiert und die Schwingkreise nahmen es an Formenvielfalt sogar mit Pasta auf. Mit der Erfindung der Vakuumröhre im Jahr 1906 fand das Radio allmählich seine endgültige Gestalt und die frühen Experimentalradios lebten nur noch in den Detektorempfängern fort, mit denen Generationen von Schulkindern an die Technikkultur herangeführt wurden.

Im Zweiten Weltkrieg tauchten eine Reihe von Bauformen für so genannte »Foxhole Radios« (Schützenlochradios) auf, die den frühen Detektorempfängern in Form und Funktion sehr ähnlich waren. Von regulären Fernmeldereinrichtungen abgeschnittene Soldaten konnten sie im Feld zusammenbasteln, um sich in den Funkverkehr mit seinen für diesen Krieg so wichtigen Informationen einzuklinken. Mit einigen leicht verfügbaren Industrieartikeln und etwas Improvisationsgabe sollte es möglich sein, einen einfachen, aber funktionierenden Radioempfänger herzustellen. Man könnte diese Radios auch als »Einsame-Insel-Radios« bezeichnen, insofern sie Technologie und Handel weitab vom organisierten Handelsverkehr ermöglichen. Wie das aus einem Kleiderbügel und einem Speak & Spell zusammengebaute Fernsprechgerät E.T.'s, so dienten auch die »Foxhole Radios« dazu, die abgerissene Verbindung mit dem Herkunftsort wiederherzustellen. Dieser rituelle Einsatz von Aktivitäten und Materialien zum Zweck, Verbindung mit einer unsichtbaren Sphäre aufzunehmen, wurde im Zusammenhang mit fremden Kulturen auch als »Cargokult« bezeichnet. Das »Foxhole Radio« diente so gesehen nicht nur der rituellen Verbindung zum Geist des eigenen Stammes, sondern war auch ein aus den Materialien der jeweiligen Umgebung gefertigtes Bastel-Selbstporträt eines Fremden.

Dimensions:	variable
Materials:	wire, chewing gum,
	discarded Starbucks coffee cup,
	America Online free installation CDs,
	pint vodka bottle, votive candles,
	aluminum foil, pencil, light bulb,
	beer drinking glass, the New Testament,
	clamps, alligator clips,
	wooden ironing boards,
	car batteries, speakers,
	home made AM radio transmitters

Exhibited at:	Foster Art Gallery, Univ. of Wisconsin, Eau Claire, WI / US	January – February 2000
Thanks to:	Michael Solway	

of chewing gum, bibles and discarded AOL CD's; coils and variocouplers from votive candles, whisky bottles and shotglasses. These diverse materials serve to make the pieces both playful and instructive. They offer a promise of communication and connection even in the direst of situations or in total isolation. They reveal that the manufactured material world is still part of the greater universe and that, unbeknownst to Bill Gates, semiconductor physics is unaccountably breeding in hidden places. Because they actually function as radios, they may help us to feel at home in the world. At any given time and place Frank Sinatra's voice can be heard in the radio waves. For the installations I add other sounds into the ether with small low powered transmitters so that you may as likely hear Joseph Stalin or Spike Jones.

Mit *Four Foxhole Radios* habe ich diese verschiedenen Aspekte des Radios — das Radio als Beleg für das Vorhandensein von Technologie in ihrer Abwesenheit, das Radio als Verbindung zum Unsichtbaren, das Radio als Porträt und Landschaft — zu thematisieren versucht. Es zeigt sich, dass Halbleiter, die zentrale Erfindung für unsere gesamte Kommunikationskultur und eines der exotischsten Produkte der Materialwissenschaft, in Wahrheit überall zu finden sind. Ich habe Dioden aus Glühbirnen, Mesquite-Grillkohle, rostigen Batterien und Nägeln aus dem 18. Jahrhundert gefertigt; Fest- und Drehkondensatoren aus Kaugummipackungen, Bibeln und ausgesonderten AOL-CDs; Spulen und Variometer aus Votivkerzen, Whiskyflaschen und Schnapsgläsern. Diese unterschiedlichen Materialien verleihen den Arbeiten einen zugleich spielerischen und lehrreichen Charakter. Sie versprechen Kommunikations- und Verbindungsmöglichkeiten selbst in den allerschlimmsten Situationen oder in totaler Abgeschiedenheit. Sie zeigen, dass die industriell gefertigte Materialwelt immer noch Teil des größeren Universums ist und dass Halbleiterphysik unerklärlicherweise — und unbemerkt von Bill Gates — an verborgenen Plätzen gedeiht. Als funktionstüchtige Radios geben sie uns vielleicht etwas mehr das Gefühl, in der Welt zuhause zu sein. In den Radiowellen ist überall und jederzeit Frank Sinatras Stimme zu hören. Für die Installationen füge ich mittels schwacher Sender dem Äther weitere Sounds hinzu, so dass man möglicherweise auch Josef Stalin oder Spike Jones hören kann.









We are the Products of our Industry

Site-specific installation **2000** (Commission)

Site specific three story high text piece commissioned for exterior museum wall. Drei Stockwerke hohe ortsspezifische Text-Arbeit für die Außenwand eines Museums.

In 2000 the Center for the Arts at Yerba Buena Gardens commissioned texts by six Bay Area artists to be temporarily displayed on the exterior walls of the museum as part of a conference on Industry and Technology. I submitted two texts to the curators for consideration:

Im Jahr 2000 gab das Center for the Arts at Yerba Buena Gardens bei sechs Künstlern aus der Bay Area Texte in Auftrag, die im Rahmen einer Konferenz über Industrie und Technologie an den Außenwänden des Museum angebracht werden sollten. Ich gab den Kuratoren zwei Texte zur Auswahl: den Text (oben), der angenommen wurde, und einen Text (unten), den ich immer noch ziemlich gut finde.

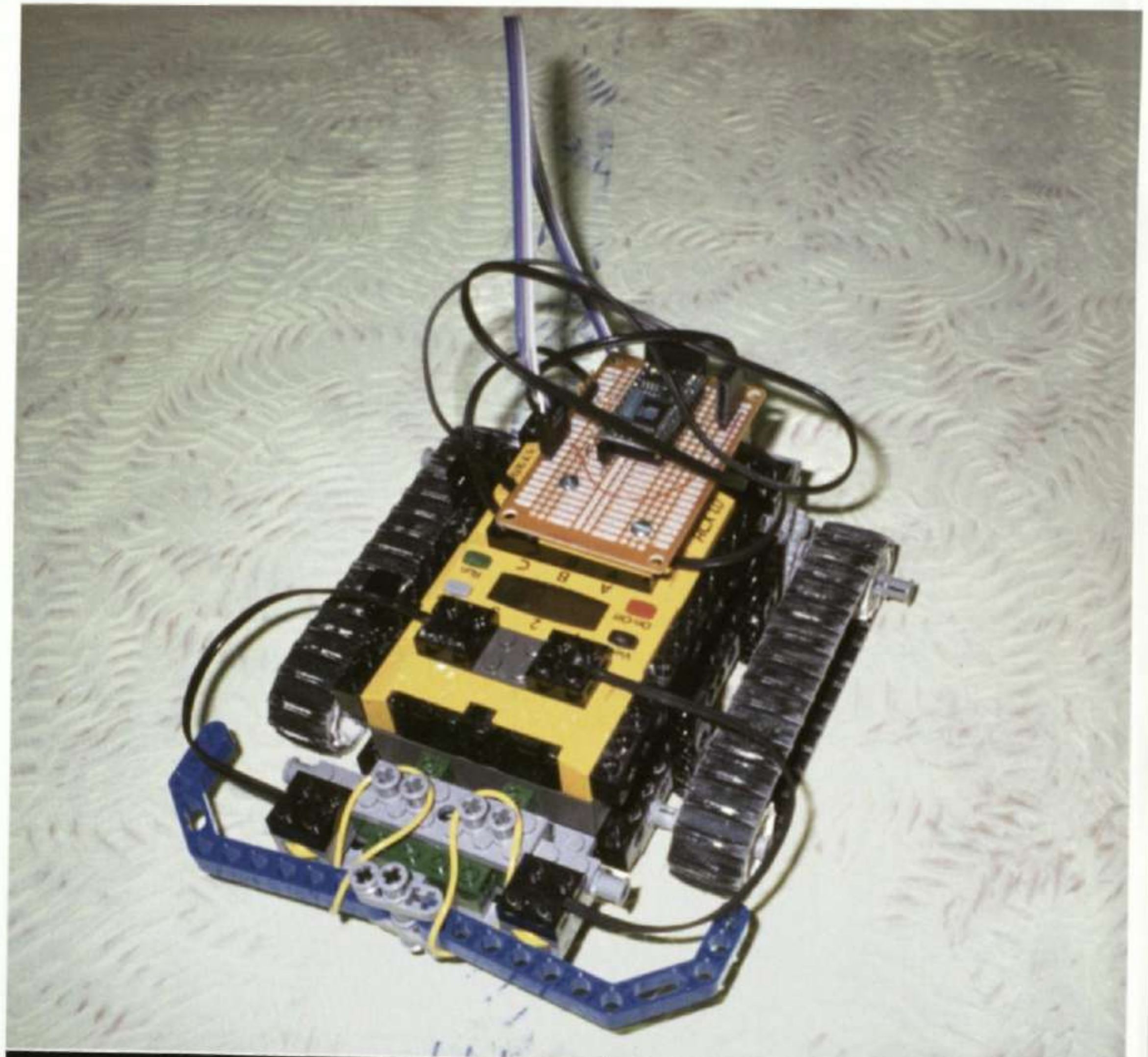
```
LOOK UP NOW!
WHILE (LIFE_SLIPS_AWAY)
        DING CHIRP GULP WAKE WAIT
        RING BUZZ CLICK WAIT HANGUP
        ROAR SQUEAK PEEL WAIT STALL
        WHIRR BONG TICK WAIT WAIT
        POP FIZZ CLINK DRINK WAIT
UNTIL();
WE ARE THE PRODUCTS OF OUR INDUSTRY.
```

which is the text they accepted, and:

WATCH OUT, HUMANS — WE'RE GONNA KICK DOWN THE WALLS OF YOUR GENOME. WE ARE TULIPS, TUNA, PETUNIAS; MAIZE, MILLET AND MUSHROOMS; YOUR DOGS & CATS, PESTS & PETS. STEP ASIDE — WE'RE FURRY & FAT, WE'RE YOUR BUTTER & FODDER. WE'RE THE NEW BARBARIANS! NOW YOU GOT HOLES IN YOUR GENES. OUCH! GOTCHA!

which I still rather like.

Exhibited at:	Center for the Arts, Yerba Buena Gardens, San Francisco, CA / US	July – August 2000	Dimensions:	40 x 80 feet
Thanks to:	Rennie Pritkin, Jim Goldberg		Material:	vinyl lettering







Moondust Memories

Installation 2001

Little autonomous rover-robots explore the dark side of the moon, leaving behind luminous traces; accompanied by outer space sounds, occasionally punctuated by alien giggles and a flash of light. Kleine autonome Rover-Roboter erforschen die dunkle Seite des Mondes und hinterlassen dabei Leuchtspuren; das Ganze begleitet von kosmischen Sounds und durchbrochen von außerirdischem Gekicher und einem Lichtblitz

Moondust Memories was created in response to a call for an exhibition that urged the artists to employ Lego Mindstorms, a programmable toy robotic system for children. My initial response was not too enthusiastic — little blocks of bright yellow and blue plastic have neither the visual appeal nor the strength of the materials I usually engage to make pieces. Moreover, the system required daily battery replacement. I solved the structural problems with cyanoacrylate glue, the visual problems by making the piece happen in total darkness, but the battery problem persisted.

I built two units of one of the simplest Lego robot prototypes called »Hank the Bumper Tank« — these are little units that move forward until they bump into something, back off at a random angle, and then move bravely forward again, endlessly bumbling around a delimited space. I added some blinking blue LEDs beneath the vehicles so that as they randomly traversed a six foot diameter circular rink covered with phosphorescent powder, they left little footprint trails of glowing green light behind them. By dint of algorithmic simplicity these trails appear as intricate abstract drawings that are created before the eyes of viewers in real time.

The three-channel soundtrack, loosely based on 1950s electronic sci-fi movie sounds, also triggers a fit of alien giggles and a bright strobe flash periodically. The lunar landscape is flooded with a green glow broken by shadows of the little tanks that persist long after they have moved on.

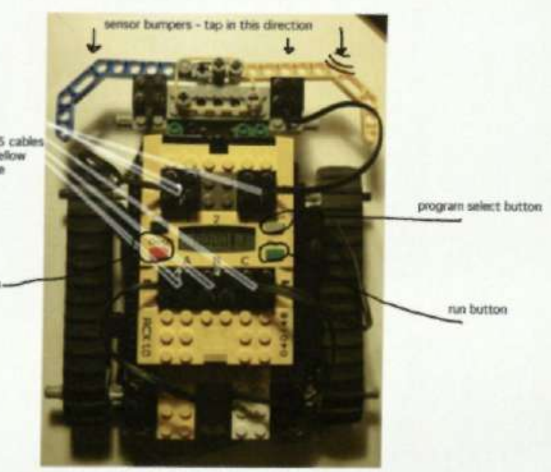
Moondust Memories entstand auf Anfrage für eine Ausstellung, bei der alle teilnehmenden Künstler/innen mit Lego Mindstorms, einem programmierbaren robotischen Spielzeugsystem, arbeiten sollten. Ich war anfangs nicht gerade begeistert — kleine gelbe und blaue Plastikbausteine besitzen weder den visuellen Reiz noch die Kraft der Materialien, mit denen ich normalerweise arbeite. Darüber hinaus erforderte das System einen täglichen Batteriewechsel. Ich löste die strukturellen Probleme mit einem Cyanoakrylat-Kleber und die visuellen, indem ich das Ganze in vollkommener Dunkelheit stattfinden ließ. Die Batterieprobleme aber blieben bestehen.

Ich baute zwei Einheiten von einem der einfachsten Lego-Roboter-Modelle — »Hank the Bumper Tank« —, einem kleinen Fahrzeug, das solange vorwärts fährt bis es irgendwo anstößt, dann in einem Zufallswinkel wieder zurücksetzt und es aufs Neue versucht, so dass es endlos auf einem begrenzten Raum herumirrt. Ich brachte unterhalb der beiden Fahrzeuge eine blinkende blaue Leuchtdiode an, so dass sie auf ihrem zufälligen Kurs in dem mit einem phosphoreszierenden Puder bedeckten Ring von zwei Meter Durchmesser kleine grün leuchtende Fährten hinterließen. Dank der algorithmischen Einfachheit erscheinen diese Fährten als in Echtzeit vor den Augen der Betrachter entstehende abstrakte Zeichnungen.

Der lose an elektronische Klänge aus Science-Fiction-Filmen der 1950er Jahre angelehnte dreikanalige Soundtrack löst periodisch außerirdische Kicheranfälle und grelle Stroboskopblitze aus. Die Mondlandschaft ist in ein grünes Licht getaucht, das von den Fährten der kleinen Fahrzeuge ausgeht, die auch noch nachleuchten, nachdem die Fahrzeuge längst schon woanders sind.

Exhibited at:	New Langton Arts, San Francisco, CA / US	June 2001
	Gallery 2211, Los Angeles, CA / US	March 2002
	T.W. Stanford Art Gallery, Stanford University, CA / US	September – October 2002
	UMBC Art Gallery, Baltimore, MD / US	October 2005 – January 2006
Thanks to:	Lego Corporation, Marcia Tanner	

Dimensions:	installation 15 x 15 feet
Materials:	Lego Mindstorms, phosphorescent powder, LEDs, microprocessors, sound, darkness, lights





Walls in the Air

Installation 2001

A 1948 Polish Diora »Pionier« radio picks up transmitted signals derived from historical Radio Free Europe archival recordings intermingled with local AM radio broadcasts. This transparency of past and present is made evident as visitors tune through the AM dial. Ein polnisches Radio aus dem Jahr 1948, ein Diora »Pionier«, fängt aus historischem Archivmaterial von Radio Free Europe stammende und mit Programmen von lokalen Mittelwellensendern gemischte Signale auf. Betätigen die Ausstellungsbesucher den Sendersuchknopf, tritt dieses Ineinander von Gegenwart und Vergangenheit zutage.

Walls in the Air was created for an exhibition of historical archives pertaining to Radio Free Europe on the occasion of the archives of that organization being acquired by the Hoover Institution, a federal archive located at Stanford University. Integrated into the architecture of the institution's gallery, it is comprised of a floor-to-ceiling section of plaster and lath wall, finished on one side, rough on the other. On the institutional-green finished side is a small shelf that holds an old tube radio and some Soviet era memorabilia — medallions and images of Stalin and Lenin. The radio intersects the wall, so that its back is visible on the rough side of the wall. Also on the rough side, nestled on the floor is an old footlocker on which are placed some 1950s comic books and a home made crystal radio.

The footlocker holds six low-powered AM radio transmitters that broadcast historical speech and music from the Radio Free Europe archives, parts of programs that were actually made during the cold war. The transmitters are tuned to blank spots on the radio dial, so that as visitors tune the radio to different stations, the historical materials is seamlessly interwoven with whatever is being broadcast in the AM band locally.

Walls in the Air wurde für eine Ausstellung historischer Archive zu Radio Free Europe entwickelt, die anlässlich des Erwerbs dieses Materials durch die Hoover Institution, ein an der Stanford University beheimatetes Bundesarchiv, stattfand. Die in die Architektur der Institutsgalerie integrierte Arbeit bestand aus einer vom Boden zur Decke reichenden Holzwand, die auf der einen Seite glatt verputzt, auf der anderen unbearbeitet war. Auf der institutsgrün gestrichenen glatten Seite befand sich ein kleines Regal mit einem alten Röhrenradio und einigen Sowjetmemorabilien — einem Stalinbild und einem Leninmedaillon. Das Radio durchbrach die Wand, so dass dessen Rückseite auf der unbearbeiteten Wandseite zu sehen war. Auf dieser Seite der Wand stand auch eine alte Truhe, auf der einige Comichefte aus den 1950er Jahren und ein selbstgebauter Detektorempfänger lagen.

In der Truhe waren sechs schwache Mittelwellensender untergebracht, die historische Sprach- und Musiksendungen aus dem Radio-Free-Europe-Archiv ausstrahlten, Programme aus der Zeit des Kalten Krieges. Diese Sender waren auf nicht belegte Zwischenräume in der Senderskala eingestellt, so dass sich das historische Material nahtlos zwischen die lokalen Mittelwellensender mischte, wenn Ausstellungsbesucher nach einer Radiostation suchten.

Exhibited at: The Hoover Institution, Stanford, CA / US April – December 2001
Thanks to: Cissie Hill, Aaron De Beers

Dimensions: 5 x 3 x 10 feet
Materials: plaster, lath, timber, radio, crystal receiver, AM transmitters, comic books, sound

See also text Walls in the Air (2001) → 245



360 *SOUND AND MUSIC.*

ble image that characterizes the peculiar sound of the letter *r*.

The dependence of the quality of tone on the number

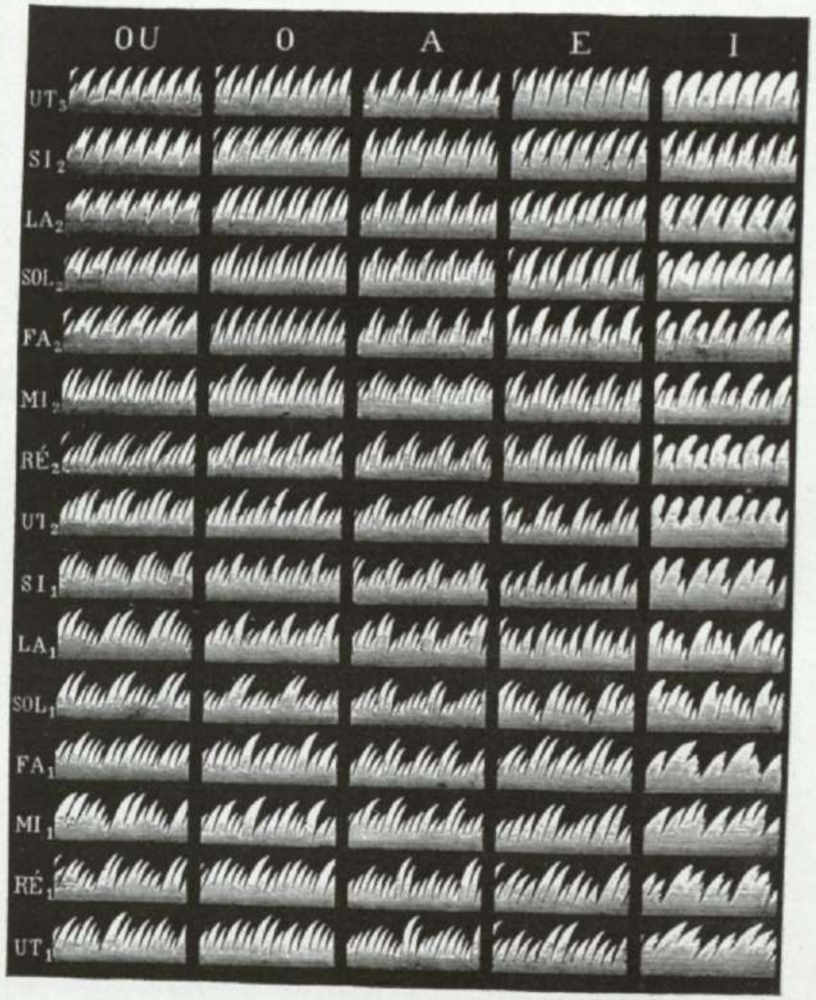


Fig. 158.

and relative intensity of the upper partials that accompany their prime, can be very strikingly shown by a simple experiment that any one can make on the pianoforte.

According to Scripture

Installation 2002

Sounds from before the age of the recording. An installation of large digital prints of sound traces made before the invention of the phonograph, accompanied by sound samples derived from these graphic traces by computer processing of line images into sound files. Klänge und Geräusche aus der Zeit vor Erfindung der Tonaufnahme. Eine Installation mit großen Digitaldrucken von Schallkurven aus dem vorphonographischen Zeitalter begleitet von Audiobeispielen, die durch die Computerbearbeitung der Kurvengrafiken gewonnen wurden.

The official date of the first sound recording is usually pegged to Edison's early phonograph demonstrations in 1878. In fact, intentionally recorded sounds had been recorded and preserved in a number of media, prominently the phonautograph of Léon Scott used since 1853 and the manometric flame waveforms made since the 1860s.

Many of these were reproduced as graphic traces in books on acoustics and physics in the years preceding the phonograph, but since they could not be played back, they were unverifiable traces. To make matters worse, they were repeatedly copied by successive engravers, and so acquired errors of eye and hand along the way. Visual images of sounds from early books on physics and acoustics were collected and scanned to digital files. Using Max/MSP the files were converted to audio, reconstructing the original sound. In some cases this process resulted in credible audio files of the original files. Other cases revealed errors in recording, or mistakes in identification. Some of the sounds are brief chirps or short tones of tuning forks. Others contain speech, sometimes garbled, at times understandable.

Die erste Tonaufzeichnung wird offiziell auf Edisons früheste Phonographen-Demonstrationen im Jahr 1878 datiert. Tatsächlich aber wurden Klänge und Geräusche schon früher in einer Reihe unterschiedlicher Medien festgehalten, vor allem mithilfe des seit 1853 gebräuchlichen Phonautographen von Léon Scott und der seit 1860 eingesetzten manometrischen Flamme.

Viele dieser Aufzeichnungen wurden vor der Erfindung des Phonographen in Akustik- und Physikbüchern als Kurvengrafiken reproduziert, waren aber nicht verifizierbar, da sie nicht wiedergegeben werden konnten. Da sie von den Kupferstechern zudem immer wieder kopiert wurden, schlichen sich im Lauf der Zeit auch noch Seh- und Zeichenfehler ein. Für die Installation wurden visuelle Schalldarstellungen aus frühen Physik- und Akustikbüchern eingescannt und digitalisiert. Mithilfe von Max/MSP wurden diese Bilddateien dann in Audiodateien umgewandelt, um den ursprünglichen Klang zu rekonstruieren. In einigen Fällen führte dieses Verfahren zu glaubhaften akustischen Umsetzungen der Originaldokumente, in anderen enthüllte es Aufzeichnungsfehler oder falsche Zuordnungen. Bei vielen dieser Schallereignisse handelt es sich um kurze Klangsplitter oder Töne von Stimmgabeln. Mitunter sind aber auch mehr oder weniger verständliche Sprachelemente zu hören.

Exhibited at:	Stadtgalerie Saarbrücken, DE	June – July 2002
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	September – November 2010
Thanks to:	Ben Dean, Adriane Colburn	

Dimensions:	variable
Materials:	digital prints,
	sounds

See also essay **According to Scripture** (2002) → 247

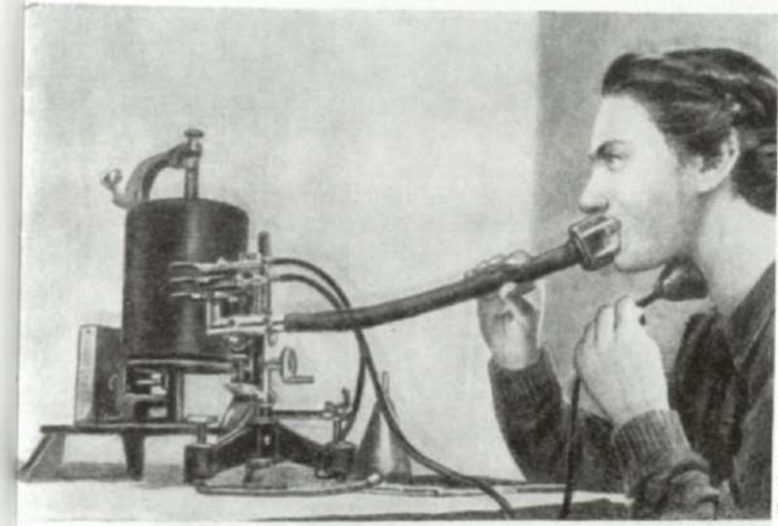


Рис. 20. Пневматическая регистрация речи

AND PHOTOGRAPHING SOUND WAVES

ion of the phonograph was invented by Bell
ınd called the graphophone; Berliner intro-
thod of etching the original record on a zinc
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sed slowly over the record, a beam of light

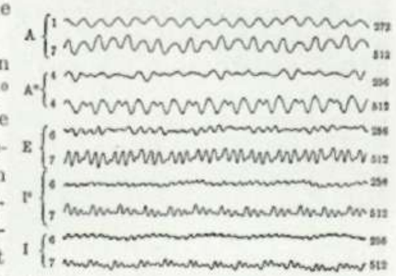


Fig. 63. Vowel curves enlarged from a phonographic record.



(Tommy Franks) Dérive Quebec

in Corps étranger (collaboration with Diane Landry*) Installation 2003

A large wooden disk rolls and tilts unpredictably. A video projection on a nearby screen appears to be related to the disk's movements. Eine große Holzscheibe vollführt unvorhersehbare Kreis und Kippbewegungen. Eine Videoprojektion in der Nähe scheint damit zusammenzuhängen.

Emile Morin, the director of Avatar, asked Quebec-based artist Diane Landry and me to create a collaborative project by connecting our studios telematically.

In January 2002 we set up webcams in our respective studios and for a period of several months worked on separate projects, responding to what we saw in the web images on our computers and by an involved method of passing coded messages via altered texts. In this way we each created individual pieces to be exhibited together in the Manif d'Art exhibition the following year.

In the end, the element of the secreted camera became the kernel for both our works. I made *(Tommy Franks) Dérive Quebec*, a 4 foot diameter wooden disk pivoting on a ball bearing. Inside, a little LEGO tank equipped with a 2.4 GHz video camera makes a frenetic tour over a fancifully rearranged map of Quebec City. It transmits this moving image to a large video projection and, as the little tank upsets the balance, the disc pivots and tilts inexplicably. Diane Landry created a cloth structure with a moving device inside. Its video is transmitted to another video projector. Over each projection is a small screen that displays the images logged from the webcams in our two studios during the period of collaboration.

Emile Morin, der Leiter von Avatar, schlug der Québecer Künstlerin Diane Landry und mir vor, über die telematische Verbindung unserer Ateliers ein Gemeinschaftsprojekt zu entwickeln.

Im Januar 2002 brachten wir in unseren Ateliers jeweils eine Webcam an und arbeiteten dann mehrere Monate lang an separaten Projekten, mit denen wir auf das reagierten, was wir auf den Bildern des jeweils anderen sahen und was wir uns mit einem verwickelten Austausch verschlüsselter Nachrichten durch die Veränderung von Texten mitteilten. Auf diese Weise entstanden Einzelarbeiten, die wir im folgenden Jahr bei der Manif d'Art gemeinsam ausstellten.

Am Ende bildete eine versteckte Kamera den Kern unserer beider Arbeiten. Von mir kam *(Tommy Franks) Dérive Quebec*, ein in der Mitte auf einem Kugellager ruhender flacher Holzzylinder von ca. 120 cm Durchmesser. In seinem Inneren fuhr ein mit einer 2,4 GHz Videokamera ausgestattetes kleines LEGO-Panzerfahrzeug in wilden Bahnen über einen frei gestalteten Stadtplan von Québec und übertrug die dabei aufgenommenen Bilder auf eine große Projektionsfläche. Da der kleine Panzer fortwährend das Gleichgewicht des Zylinders veränderte, vollführte dieser unerklärliche Kreis- und Kippbewegungen. Diane Landry schuf ein textiles Gebilde mit einer beweglichen Kamera im Inneren. Ihre Videos wurden auf eine andere Projektionsfläche übertragen.

Vor beiden Projektionen war ein kleiner Monitor aufgehängt, auf dem die während der Arbeitsphase entstandenen Bilder von unseren Atelier-Webcams zu sehen waren.

*Diane Landry (*1958) lives and works in Quebec City. Since 1987, her works have traveled widely across Canada and in major cities in the USA, Mexico, Argentina, many European countries, Australia and China. They have been discussed in numerous publications and recognized by important awards in Quebec as well as in the United States. She is the first recipient of the prestigious Giverny Capital Prize, a distinction awarded to a visual artist from Quebec. Diane Landry holds a MA from Stanford University, California. She is represented by SolwayJones Gallery in Los Angeles.

Diane Landry (*1958) lebt und arbeitet in Québec. Ihre Arbeiten sind seit 1987 in ganz Kanada, vielen großen Städten in den USA, in Mexiko, Argentinien, zahlreichen europäischen Ländern, Australien und China gezeigt und in vielen Artikeln besprochen worden. Sie erhielt bedeutende Preise in Québec und den Vereinigten Staaten, ist u.a. die erste Preisträgerin des angesehenen Giverny Capital Prize, einer Auszeichnung für bildendende Künstler/innen in Québec. Diane Landry hat einen MA von der Stanford Universität und wird von der SolwayJones Gallery in Los Angeles vertreten.

Exhibited at: Manif d'art 2, Quebec, CA May – June 2003
Commissioned by Avatar, Quebec, CA

Materials: Lego Mindstorms robotic system, wood, maps, wireless video camera











Firebirds

Installation 2004

Oracular flames kept captive within birdcages recite speeches of some dictators of the twentieth century. Gas flames, suitably modulated by electrical fields can be made to act as omnidirectional loudspeakers of surprising clarity and amplitude. In Vogelkäfigen gehaltene orakelhafte Flammen rezitieren Reden einiger Diktatoren des 20. Jahrhunderts. Bei entsprechender Modulation durch elektrische Felder können Gasflammen zu omnidirektionalen Lautsprechern von überraschender Klarheit und Lautstärke werden.

One evening in 1975 I was sitting around the fireplace with friends after dinner, finishing a bottle of wine, staring into the fire. During a lull in the conversation we clearly heard part of a radio transmission emanate from a gas jet coming out the end of a log — the last measures of a pop song followed by a few words of a radio announcer's voice. But how could this be? I asked Maggi Payne who pointed me to an *AES Journal* article that had been published a few years earlier by researchers at United Technologies Corporation in Sunnyvale California. They described an electrothermal loudspeaker experiment that used an oxyacetylene flame, seeded with Potassium ions and modulated by a high voltage audio signal. A few years later, in the spring of 1980, I was able to borrow the requisite materials from the physics Department at Wesleyan University where I was teaching, to replicate the experiment. Indeed a loud and clear audio signal appears to come out of the empty space of the flame, radiating omnidirectionally. Although this did not entirely explain the anomalous voice received by the fireplace log, it did serve to confirm at least the physical possibility of such an occurrence.

The complex set-up, employing lethally high voltages and hot welding flames did not seem to lend itself easily to any of the audio projects I was involved with at the time. In the meantime, Maggi built an exhibit at the Exploratorium that demonstrated the phenomenon of sound reproduction by flame.

It was not until 2003, after being deeply involved in the history of radio as a technical and as a social medium, that the flame loudspeaker would re-emerge in my work in the form of *Firebirds*. As a metaphor for speech, a flame seems to fit well the image of an individual voice that could be blown out in a puff, but could also ignite the world. The flames of *Firebirds* burn within their birdcages — each one a sort of enchanted prison cell in the afterlife for voices that wielded enormous political power during their lifetimes, assisted in no small measure by the medium of radio: Josef Stalin, Adolf Hitler, Franklin Roosevelt and Benito Mussolini. The sounds of birds, ranging from my own field recordings in the Australian outback to old 78 rpm recordings of singing canaries accompanied by organ music, are mixed in with the political voices to situate them in the afterlife that all dead sounds share.

1975 saß ich eines Abends nach dem Essen mit Freunden um einen offenen Kamin, eine Flasche Wein zu Ende trinkend und ins Feuer starrend. Während einer Gesprächspause hörten wir deutlich, wie ein Teil einer Radiosendung aus der Gasflamme am Ende eines Holzscheits drang — die letzten Takte eines Popsongs, gefolgt von ein paar Worten eines Radiomoderators. Wie konnte das sein? Ich fragte Maggi Payne, und sie verwies mich auf einen zwei Jahre zuvor im *AES Journal* erschienenen Artikel eines Forschungsteams von der United Technologies Corporation in Sunnyvale, Kalifornien. Darin wurde ein Experiment mit einem elektrothermischen Lautsprecher beschrieben, der aus einer mit Kalium-Ionen versetzten und mit einem Hochspannungsaudiosignal modulierten Acetylenflamme bestand. Einige Jahre später, im Frühjahr 1980, besorgte ich mir die notwendigen Materialien aus dem Physikinstitut der Wesleyan Universität, wo ich damals unterrichte, um das Experiment zu replizieren. Tatsächlich schien ein lautes, klares, sich in alle Richtungen ausbreitendes Audiosignal aus dem leeren Raum der Flamme zu dringen. Das erklärte zwar nicht die vom Scheit in dem Kamin empfangene anomale Stimme, bestätigte aber wenigstens, das so etwas physikalisch möglich war.

Die problematische Versuchsanordnung mit tödlich hohen elektrischen Spannungen und superheißen Schweißflammen schien sich nicht besonders für eines der Klangkunstprojekte zu eignen, an denen ich zu der Zeit arbeitete. Und später baute Maggi ein Objekt am Exploratorium, das das Phänomen der Audiowiedergabe mittels einer Flamme demonstrierte.

Erst 2003, nach einer Phase intensiver Beschäftigung mit dem Radio als technischem und sozialem Medium, tauchte der Flammenlautsprecher in Form der *Firebirds* erneut in meiner Arbeit auf. Eine Flamme schien mir eine gute Metapher für die Rede, die Stimme des Einzelnen zu sein, die mit einem einzigen Atemstoß ausgepustet werden könnte, aber auch imstande ist, die ganze Welt in Flammen aufgehen zu lassen. Die Flammen von *Firebirds* brennen in Vogelkäfigen, von denen jeder eine Art magische Gefängniszelle für das Nachleben einer Stimme darstellt, die zu Lebzeiten — nicht zuletzt mithilfe des Radios — enorme politische Macht ausübte: der Stimme Josef Stalins, Adolf Hitlers, Franklin Roosevelts und Benito Mussolinis. Um die Politikerstimmen in dem Jenseits zu situieren, das allen toten Klängen gemeinsam ist, sind Vogelstimmen unter sie gemischt, die von eigenen Field recordings im australischen Busch bis zu 78 rpm Platten mit singenden Kanarienvögeln, unterlegt mit Orgelmusik, reichen.

Exhibited at:	Braunstein Quay Gallery, San Francisco, CA / US	April – May 2004
	singuhr – hoergalerie, Berlin, DE	June – August 2004
	Garage Media Art Festival, Stralsund, DE	August 2004
	OK Centrum für Gegenwartskunst, Linz, AT	September 2005
	Kunstencentrum Vooruit, Gent, BE	February 2006
	Galerie Kapelica, Ljubljana, SI	March 2006
	Happy New Ears Festival, Kortrijk, BE	September – October 2006
	Kontejner, Zagreb, HR	November 2007
	Klangraum Krems, AT	March – July 2010

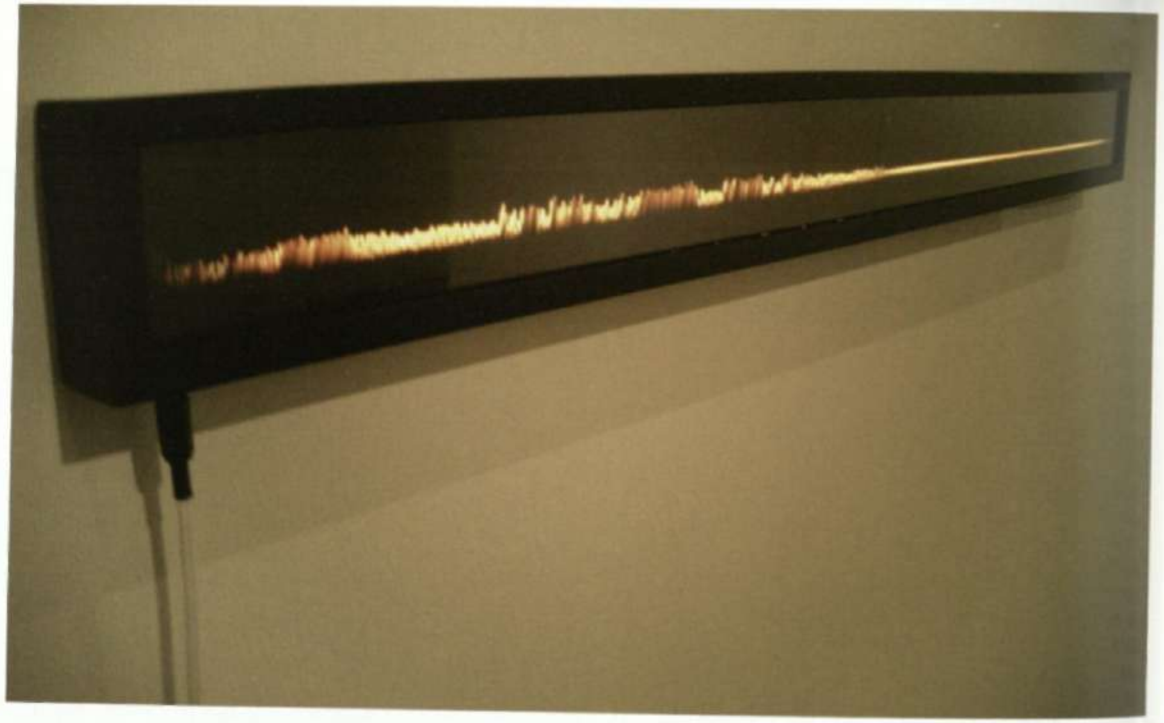
Supported by a grant from The Rockefeller New Media Foundation

Ars Electronica Honorary Mention 2005

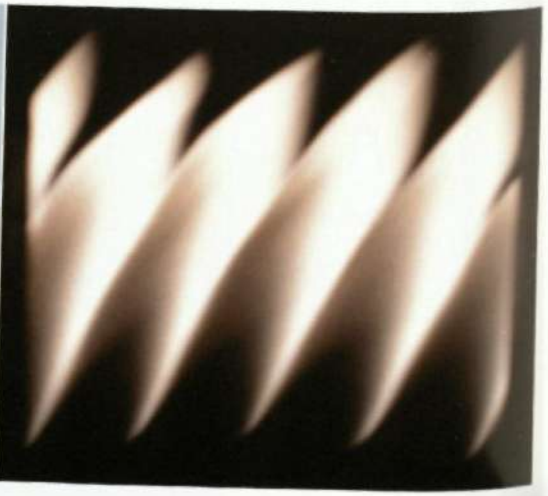
Thanks to: Maggi Payne, Rockefeller Foundation

Dimensions:	variable;
	individual dimensions:
	17 Inches diameter x 60 Inches
Materials:	custom electronics,
	propane,
	four bird cages,
	historic speeches

See also **Torch Song** (2003), a related performance realization → 204 and essay **Firebirds** (2004) → 257







Tongues of Fire

Installation 2004

Film recordings of vibrating flames representing the articulation of speech based on 19th century manometric flame devices. Auf den manometrischen Flammen des 19. Jahrhunderts basierende Filmaufnahmen von vibrierenden Flammen, die mündliche Sprachäußerungen wiedergeben.

The manometric flame was a nineteenth century predecessor of the oscilloscope and, as such, the originating device for the visual representation of sound used in all contemporary digital audio editing software. The sensitivity of gas flames to sounds was first recognized by John LeConte, who witnessed the phenomenon during a musical soiree at an ante-bellum southern plantation in 1853. The cello tones in a Beethoven trio were observed to make an illuminating gas flame jump and change form in very precise ways. LeConte wrote a letter describing this phenomenon to John Tyndall, who studied it in detail. By observing the vibrating flame in a rotating mirror that swept the image across his retina, Tyndall could see the vibrations of the sound represented as a visual waveform. Subsequently commercialized by the Parisian scientific instrument maker Koenig, the manometric flame device became a standard tool for the study of sound, particularly phonetic research, until it was superseded by its electronic replacement, the Braun tube (oscilloscope) around 1911.
Tongues of Fire visualizes a dozen 15-second segments of a speech by George W. Bush on the occasion of the invasion of Iraq. Each was created on a unique strip of 120 Ektachrome film passing continuously across the focal plane of a self-made slit-scan camera. The long horizontal traces of speech-as-flame offer the appearance of landscapes on fire.

Die manometrische Flamme war ein Vorläufer des Oszilloskops im 19. Jahrhundert und als solches das erste Instrument zur visuellen Darstellung akustischer Ereignisse, wie sie heute Teil aller digitalen Audioeditoren ist. Die Empfindlichkeit von Gasflammen für Klänge wurde erstmals von John LeConte entdeckt, der das Phänomen 1853 bei einer musikalischen Soirée auf einer Südstaaten-Plantage beobachtete. Die Cellotöne in einem Beethoventrio ließen die Flammen einer Gaslampe auf ganz exakte Weise aufund abhüpfen und ihre Form verändern. LeConte beschrieb das Phänomen in einem Brief an John Tyndall, der es dann genauer erforschte. Indem er das Phänomen in einem rotierenden Spiegel beobachtete, der das Bild an seinem Auge vorbeiziehen ließ, konnte Tyndall die Schallschwingungen als Wellenform sehen. In ihrer kommerzialisierten Form durch den in Paris ansässigen wissenschaftlichen Instrumentenbauer Rudolph Koenig wurde die manometrische Flamme schließlich zu einem Standardgerät der akustischen Forschung, speziell in der Phonetik, bis sie um 1911 von der Braunschen Röhre (dem Oszilloskop) abgelöst wurde.
Tongues of Fire visualisiert ein Dutzend 15-Sekunden-Bruchstücke aus einer Rede, die George W. Bush anlässlich der Irak-Invasion hielt. Sie wurden jeweils auf einem einzigen 120 Ektachrom-Filmstreifen aufgenommen, der gleichmäßig an der Brennebene einer selbst gebauten Slitscan-Kamera vorbeigeführt wurde. Die langen horizontalen Redespuren in Flammenform vermitteln den Eindruck von brennenden Landschaften.

Exhibited at:	Braunstein Quay Gallery, San Francisco, CA / US	April – May 2004
	singuhr – haergalerie, Berlin, DE	June – August 2004
	Bryce Wolkowitz Gallery, New York, NY / US	April – May 2007
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	September – November 2010

Dimensions:	31 x 3 x 3 inches
Materials:	Ektachrome film, wood light boxes

See also essay **Firebirds** (2004) → 257

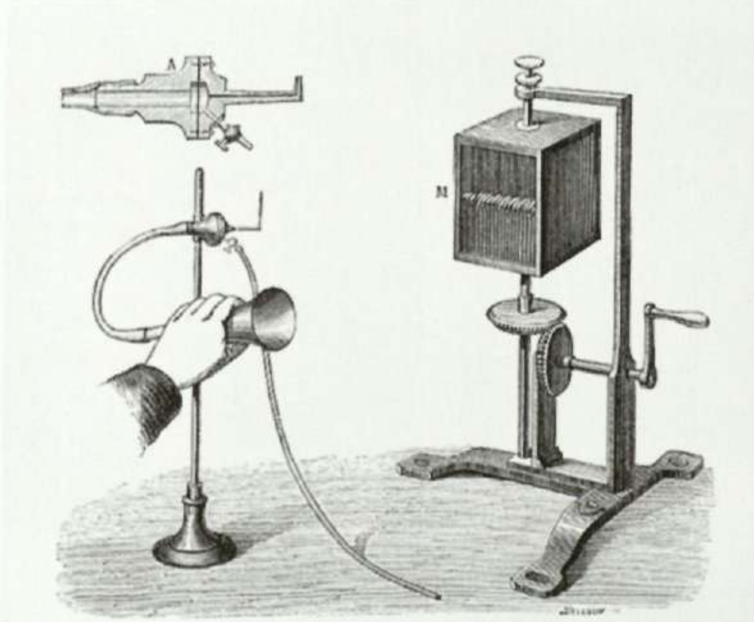
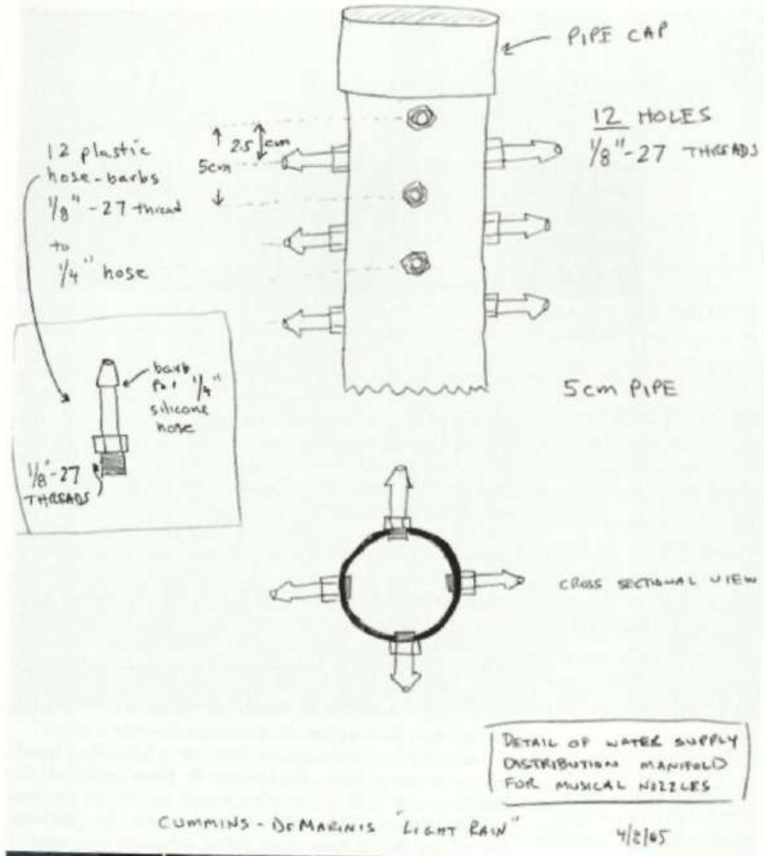


FIGURE 2-8. Apparatus for production of images of vowels, Koenig's version. (From Koenig [71].)





A Light Rain

in collaboration with Rebecca Cummins* Installation 2004

A Light Rain combines elements of Rebecca Cummins' Rainbow Machine and Paul DeMarinis' RainDance to create an immersive environment where the public can experience sounds and colors created by water droplets. A Light Rain verbindet Elemente von Rebecca Cummins' Rainbow Machine und Paul De Marinis' RainDance zu einem immersiven Environment, in dem Besucher durch Wassertropfen hervorgerufene Klänge und Farben erforschen können.

Light Rain is a literally »immersive« installation that explores the acoustic and optical properties of water droplets. Sound vibrations can influence the breakup of a water stream, producing distinct visual patterns. What is more amazing is that these patterns preserve aspects of the sound signal itself, such that when the drops fall on a resonating surface, such as an umbrella, recognizable melodies are produced. »Intercept the water streams with an umbrella to hear the melodies.«

The water mist produces primary and secondary rainbows while the sun shines; move and it moves with you. With early morning and late afternoon sunlight, the rainbows appear high in the sky; at mid-day, circular spectrums form on the ground. »Let the sunlight fall on your back and follow your shadow into the rainbow.«

*Rebecca Cummins explores the sculptural, experiential and sometimes humorous possibilities of light and natural phenomena, often referencing the history of optics in installations and photographs that include a camera obscura journey through the center of the earth, paranoid dinner-table devices and a variety of sculptural and photographic approaches to marking time. Recent venues include the Shanghai Biennial, the Biennial of Seville, Spain and the Shenzhen Institute of Fine Art and Zendai MOMA, China. Her *Skylight Aperture Sundial*, commissioned by the Office of Arts & Cultural Affairs and the Seattle Public Library, is permanently installed at the Montlake Branch, Seattle Public Library.

Light Rain ist eine »immersive« Installation im wahrsten Sinn des Wortes. Sie erkundet die akustischen und optischen Eigenschaften von Wassertropfen. Schallschwingungen können den Zerfall eines Wasserstahls beeinflussen und unterschiedliche visuelle Muster erzeugen. Noch erstaunlicher ist, dass in diesen Mustern Aspekte des ursprünglichen Audiosignals bewahrt werden, so dass die Tropfen, wenn sie auf eine resonierende Fläche wie etwa einen Regenschirm fallen, erkennbare Melodien erzeugen. Die Besucher werden aufgefordert, die Wasserstrahlen mit einem Regenschirm zu unterbrechen, um die Melodien zu hören.

Durch den Sprühregen entstehen bei Sonnenschein primäre und sekundäre Regenbogen, die sich mit dem Besucher oder der Besucherin mitbewegen. Im Licht des frühen Morgens und des späten Nachmittags scheinen die Regenbogen hoch im Himmel zu stehen; zu Mittag bilden sich kreisförmige Spektren auf dem Boden. Die Besucher sollen mit dem Rücken zur Sonne stehen und ihrem eigenen Schatten in den Regenbogen folgen.

Rebecca Cummins untersucht in ihren Arbeiten die skulpturalen, erfahrungsmäßigen und humoristischen Möglichkeiten von Licht und anderen Naturphänomenen, wobei sie sich in ihren Installationen und Fotografien oft auf die Geschichte der Optik bezieht. In ihren Arbeiten geht es z.B. um eine Reise mit der Camera obscura durch den Mittelpunkt der Erde, um paranoide Arrangements für den Esstisch sowie um eine Reihe skulpturaler und fotografischer Formen der Zeitstrukturierung. Sie stellte zuletzt auf der Shanghai Biennale, der Biennale von Sevilla, am Shenzhen Institute of Fine Art und am Zendai MOMA in China aus. Ihre *Skylight Aperture Sundial*, ein Auftragswerk des Office of Arts & Cultural Affairs und der Seattle Public Library, ist permanent an der Filiale der Seattle Public Library in Montlake installiert.

Exhibited at:	Kiasma Museum of Contemporary Art, Helsinki, FI	August – September 2004
	Shanghai Biennale, Shanghai, CN	September – October 2006
	Biennale di Sevilla, Sevilla, ES	October 2008 – January 2009
Thanks to:	Perttu Rastas, Petri Ryoppi	

Dimensions:	10 x 25 x 25 feet
Materials:	stainless steel, water, custom modulating nozzles, spray mist nozzles, electronics, sound, sunlight, plumbing

See also **Raindance** (1998) → 159







Re-Titled

Site-specific installation 2006

Sound-responsive installation in a bridge tunnel over the Rhine. A series of 28 sound-sensitive lights responds to the acoustic pressure waves reverberating in the tunnel to display sound as light and shadow in motion. An inverted periscope provides contact with the outside world. Auf Geräusche reagierende Installation im begehbaren Hohlkörper einer Kölner Rheinbrücke. Eine Serie von 28 schallempfindlichen Leuchten zeigt die akustischen Druckwellen im Tunnel-Hohlkörper als Bewegung von Licht und Schatten an. Ein umgekehrtes Periskop ermöglicht den Kontakt mit der Außenwelt.

A site-specific temporary work created for the structural space beneath the Deutzer Brücke, a concrete and steel span that crosses the Rhine river at Cologne. The space used for the installation comprised one third of the total length of the bridge, approximately 120 meters, and was constructed of grey concrete of a rectangular cross-section, approximately 4 to 9 meters in height and 13 meters wide. The rectangular profile closely approximates a waveguide and the resonant period of the length is about two thirds of a second.

The space presents a somewhat oppressive environment for visitors, who must pass through the constricted structural elements of the bridge to gain entrance to the dark and cold space and walk around three hundred meters in the dark, beneath the bridge roadway, to view the installation. Once there, they must re-traverse the entire distance before re-emerging into sunlight and fresh air. By placing sound-pressure activated lights at regular intervals, the passage of sound can be seen to move along the length of the tunnel. When the tunnel is quiet the entire space is dark. A yell or clap can excite a few lights to provide brief pulses of light with which to navigate the passageway. The passage of trains and trams over the roadway above fills the space with an enormously loud roar. The sound can be seen to build up as the lights turn on, and die away as the echoes fade, revealing traveling patterns of light and dark that pass back and forth along the length of the tunnel revealing the nodes and nulls in the sound field.

At the very end of the tunnel, an existing 10-centimeter hole bored through the concrete floor permits the passage of fresh air, light and sounds from the river bank below. Into it was improvised an inverted periscope, made of PVC pipe and mirrors, that allows visitors a glimpse of the world outside, along with its air and sounds, before beginning their journey back through the tunnel.

Eine ortsspezifische temporäre Arbeit für den Hohlraum unter der Deutzer Brücke, einer aus Stahl und Beton konstruierten Rheinbrücke in Köln. Der Raum für die Installation umfasste etwa ein Drittel der gesamten Brückenlänge, rund 120 Meter, bestehend aus grauem Beton und hat einen rechteckigen Querschnitt von vier bis neun Metern Höhe und 13 Metern Breite. Mit seinem rechteckigen Profil kommt er einem Wellenleiter nahe, dessen Resonanzperiode der Länge nach ungefähr 2/3 Sekunden beträgt.

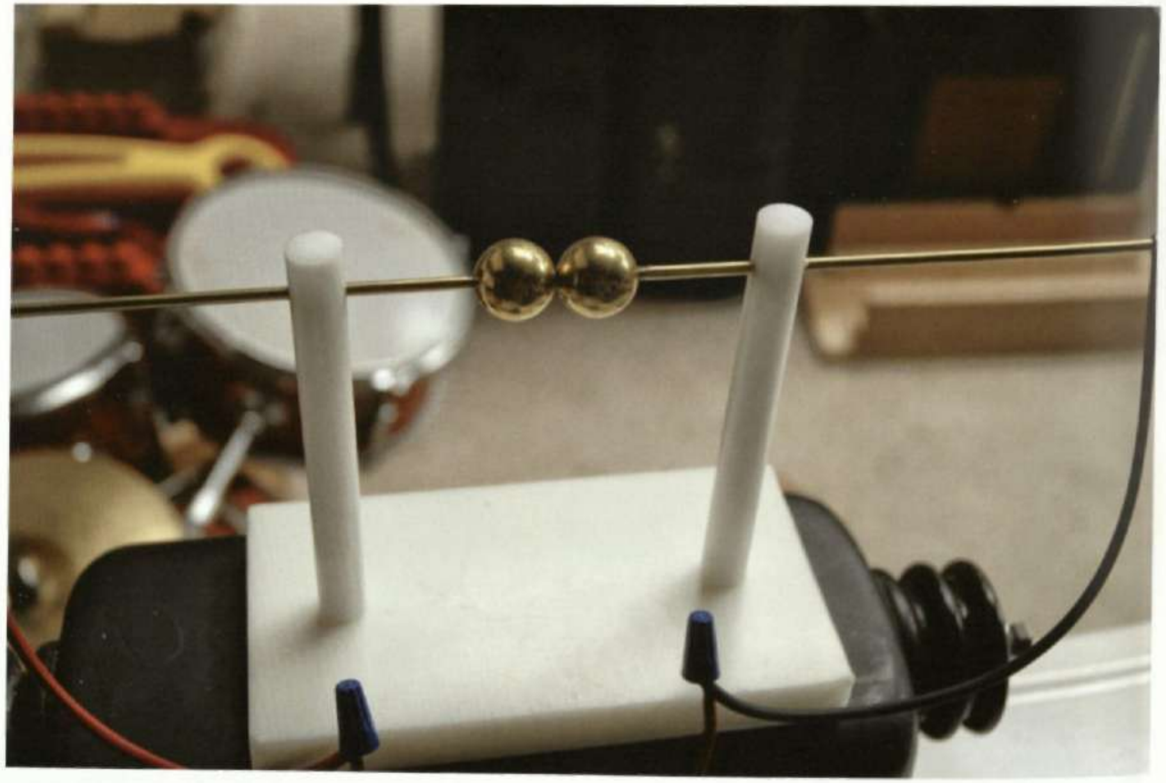
Der Raum stellt für Besucher eine etwas bedrückende Umgebung dar, müssen sie doch zuerst durch eine enge Öffnung in den dunklen und kalten Brückenhohlkörper einsteigen, und dann ca. dreihundert Meter unter der Brückenfahrbahn zurücklegen, um die Installation im letzten Brückensegment zu besichtigen. Danach müssen sie die ganze Strecke wieder zurückgehen, um ans Tageslicht und an die frische Luft zu gelangen.

In regelmäßigen Abständen platzierte luftdruckaktivierte Leuchten ermöglichen es, die Fortpflanzung von Geräuschen im Tunnel zu verfolgen. Ist es im Tunnel still, ist der gesamte Raum dunkel. Mit einem Schrei oder Klatschen kann man ein paar Leuchten kurz aufflackern lassen, um sich bei der Bewegung im Tunnel zu orientieren. Über die Brücke fahrende Straßenbahnen füllen den Raum mit einem enorm lauten Dröhnen. An den Leuchten ist abzulesen, wie es sich aufbaut und mit den verhallenden Echos wieder verschwindet, wobei bewegte Licht-Dunkel-Muster über die gesamte Länge des Tunnels hin- und herwandern und die Knoten und Bäuche im Klangfeld anzeigen.

Ganz am Ende des Tunnels gelangen durch ein existierendes 10 cm großes Loch im Betonboden frische Luft, Licht und Geräusche vom darunter liegenden Flussufer in den Raum. In dieses Loch wurde ein improvisiertes umgekehrtes Periskop aus PVC-Rohren und Spiegeln eingebaut, mit dem Besucher auch einen Blick in die Außenwelt werfen können, aus der die Luft und die Geräusche kommen, ehe sie sich wieder auf den Rückweg durch den Tunnel machen.

Exhibited at: BrückenMusik, Cologne, DE June – July 2006
Thanks to: Jens Brand, hans w. koch, Echo Ho, Hannes Hoelzl

Dimensions: 120 x 13 x 9 meters
Materials: fluorescent tubes, neon power supplies, custom electronic circuits, plastic buckets, sand, PVC sewer pipe, shaving mirrors





Rome to Tripoli

Installation 2006

Based on a recreation of the 1908 radio transmitter of Majorana, high voltage and a stream of vitriolic acid convene to broadcast the corrosive and unwelcome sounds of Western culture (Mozart, Verdi, Bavarian Waltzes and Futurist poetry) toward un-attuned ears. In einem Nachbau von Majoranas Radiosender aus dem Jahr 1908 verbinden sich Hochspannung und Schwefelsäure, um die zersetzenden und unwillkommenen Klänge westlicher Kultur (Mozart, Verdi, Bayrische Ländler und futuristische Gedichte) in fremde Ohren zu träufeln.

Rome to Tripoli (2006) recreates a working radio transmitter based on the hydraulic microphone/transmitter apparatus of Q. Majorana* and G. Vanni in 1908 that successfully broadcast voice messages from Rome to Tripoli, a distance of nearly 1000 km, inaugurating the age of radio-telephony and of broadcast media. A stream of sulfuric acid, mechanically vibrated by sound, reproduces the interruptions of the vocal frequencies as a series of droplets. This stream is passed between two electrodes biased at a DC voltage. Each drop directs a short burst of electricity to a high-voltage transformer configured as a spark-gap radio transmitter. The signals are broadband and can be picked up by any AM receiver in the vicinity. The piece poses questions about the nature of one-way communications, radio-phonic, cultural or military, in particular those between Europe and North Africa. The sound distortions introduced by this crude system call to mind the harsh sounds of western European culture falling on foreign ears. A stream of vitriol creating a torrent of noise may serve as a mechanical metaphor for the many manifestations of unwelcome cultural address.

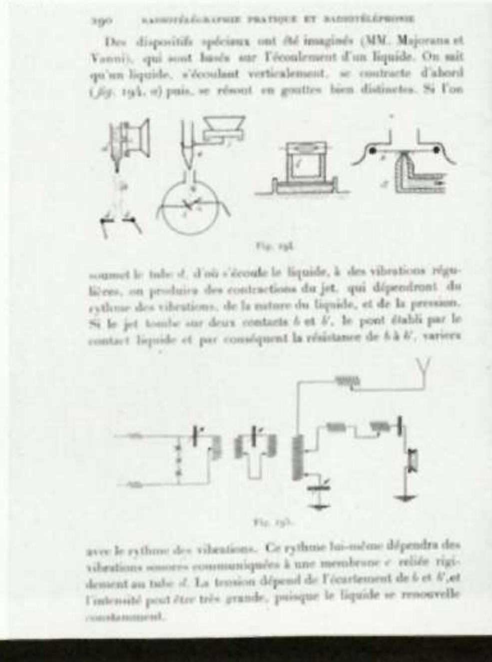
Rome to Tripoli (2006) ist der Nachbau eines funktionierenden Radiosenders nach dem Prinzip des hydraulischen Mikrofons/Senders von Q. Majorana* und G. Vanni aus dem Jahr 1908, mit dem gesprochene Nachrichten erfolgreich über eine Distanz von fast 1000 Kilometern — von Rom nach Tripolis — übertragen wurden und das Zeitalter der Funktelefonie und des Rundfunks eingeleitet wurde. Ein durch Klänge mechanisch in Schwingung versetzter Schwefelsäurestrahl reproduziert die Unterbrechungen der Vokalfrequenzen in Form von Tropfenmustern. Diese werden zwischen zwei mit Gleichspannung belegte Elektroden durchgeführt, sodass bei jedem Tropfen ein kurzer Stromimpuls zu einem als Knallfunkensender konfigurierten Hochspannungstransformator geleitet wird. Die so entstehenden Breitbandsignale können von jedem AM-Empfänger in der Umgebung empfangen werden. Die Arbeit wirft Fragen über das Wesen der radiophonen, kulturellen und militärischen Einweg-Kommunikation speziell zwischen Europa und Nordafrika auf. Die durch dieses primitive System hervorgerufenen Tonverzerrungen erinnern an den rauen Klang der westeuropäischen Kultur für fremde Ohren. Ein sich als Lärmkaskade ergießender Säurestrahl ist vielleicht eine passende technische Metapher für die vielen Erscheinungsformen unerbetender Kulturbeglückung.

* Quirino Majorana, uncle of Ettore Majorana (the eminent physicist and colleague of Fermi), also wrote on the interesting subject of Gravitational Shielding: Majorana, Q., »On gravitation. Theoretical and experimental researches«, *Phil. Mag. [ser. 6]* 39, 1920: 488–504.

* Quirino Majorana, der Onkel von Ettore Majorana (dem herausragenden Physiker und Kollegen Fermis) publizierte auch zum interessanten Thema der Gravitationsabschirmung: Majorana, Q., »On gravitation. Theoretical and experimental researches«, in: *Phil. Mag. [ser. 6]* 39, 1920: 488–504.

Exhibited at:	Vilni/Waves Festival, Riga, LV	August – September 2006
	Waves, HMKV Dortmund, DE	May – June 2008
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	September – November 2010

Dimensions:	30 x 25 x 12 inches
Materials:	spark-gap, high voltage transformer,
	electronics, sulfuric acid, pump,
	platinum electrodes, antenna,
	radio receivers, sound



190 RADIOTÉLÉGRAPHIE PRATIQUE ET RADIOTÉLÉPHONIE

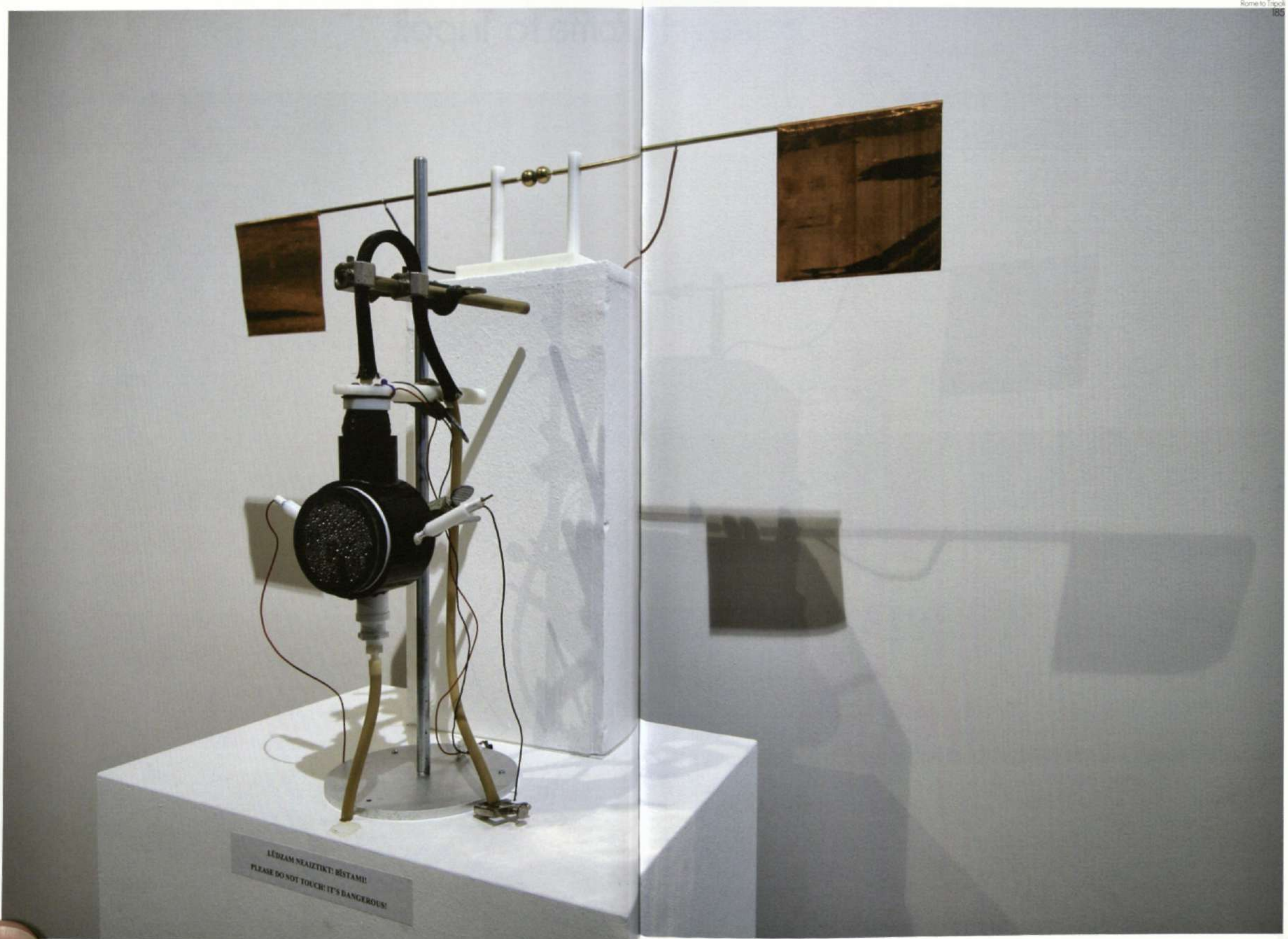
Des dispositifs spéciaux ont été imaginés (MM. Majorana et Vanni), qui sont basés sur l'écoulement d'un liquide. On sait qu'un liquide, s'écoulant verticalement, se contracte d'abord (*fig.* 194, *a*) puis, se résout en gouttes bien distinctes. Si l'on

Fig. 194.

soumet le tube *d*, d'où s'écoule le liquide, à des vibrations régulières, on produira des contractions du jet, qui dépendront du rythme des vibrations, de la nature du liquide, et de la pression. Si le jet tombe sur deux contacts *b* et *b'*, le pont établi par le contact liquide et par conséquent la résistance de *b* à *b'*, variera

Fig. 195.

avec le rythme des vibrations. Ce rythme lui-même dépendra des vibrations sonores communiquées à une membrane *c* reliée rigidement au tube *d*. La tension dépend de l'écartement de *b* et *b'*, et l'intensité peut être très grande, puisque le liquide se renouvelle constamment.


LŪDZAM NEAIZTIKT! BĪSTAMI!
PLEASE DO NOT TOUCH! IT'S DANGEROUS!

Hypnica

Sounding object 2007

Electronically rigged metronomes speak in the voices of hypnotists to lull the listener into a receptive aural state. Elektronisch aufgerüstete Metronome sprechen mit den Stimmen von Hypnotiseuren, um die Zuhörer in einen empfänglichen Zustand zu versetzen.

Precision timing is a key element of the hypnotic voice. Like the timed swinging of the pendulum, repetitive aural fixation or entrainment serves as a point of focus with which to enter a hypnotic state. Maelzel's metronome, a device virtually unchanged since its invention early in the 19th century, was intended to offer an initial and approximate indication of tempo in musical works. But as a source of precise mechanical pulses it has achieved a certain symbolic quality as anti-musical. In *Hypnica*, the hypnotist's voice is broken into a library of short phrases. Each time the metronome's inverted pendulum swings across center, an optical interrupter triggers the next in a sequence of hypnotic suggestions.

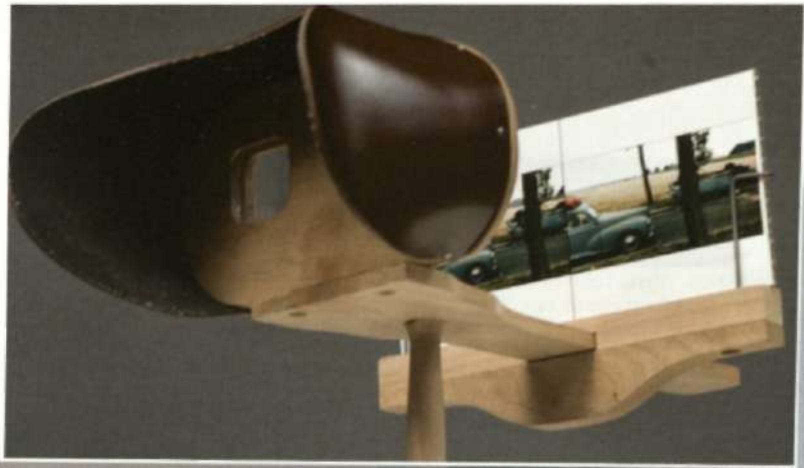
Präzises Timing ist ein Grundelement der hypnotischen Stimme. Wie die getakteten Bewegungen eines Pendels, so können auch repetitive akustische Reize als Fokus für den Eintritt in den hypnotischen Zustand dienen. Mälzels Metronom, ein seit seiner Erfindung Anfang des 19. Jahrhunderts so gut wie unverändertes Gerät, war eigentlich dazu gedacht, das ungefähre Anfangstempo für die Wiedergabe musikalischer Werke vorzugeben. Als Quelle eines exakten mechanischen Pulses hat es sich allerdings einen gewissen antimusikalischen Ruf erworben. In *Hypnica* wird die Stimme des Hypnotiseurs in kurze Phrasen zerlegt und in einem Sound Archiv gespeichert. Jedes Mal wenn das umgekehrte Pendel des Metronoms seinen Scheitelpunkt überquert, löst ein optischer Unterbrecher die nächste in einer Sequenz hypnotischer Suggestionen aus.

Exhibited at:	Solwayjones Gallery, Los Angeles, CA / US	October 2007
	Art Basel Miami Beach, FL / US	December 2007
	San Jose Museum of Art, San Jose, CA / US	May – August 2008
	Eyebeam, New York, NY / US	September – October 2008
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	September – November 2010

Dimensions:	9 x 5 x 5 inches
Materials:	metronome,
	optical interrupters,
	microprocessor, OEM MP3 boards,
	sound

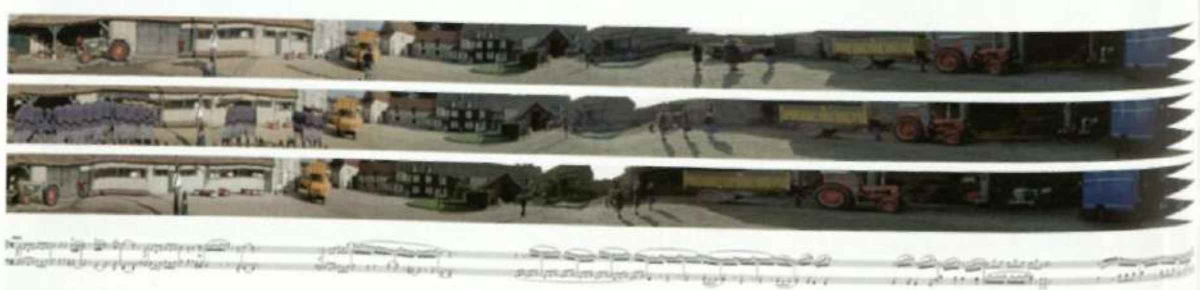
See also The Power of Suggestion performance (1988) → 202











Early Media Goes to the Movies

Installation 2008

A collection of digital prints and quasi-19th century visual media devices that recast Jean-Luc Godard's iconic film Week End (1967) as anti-cinema. Eine Reihe von Digitaldrucken und dem 19. Jahrhundert nachempfundenen optischen Geräten, mit denen Jean-Luc Godards legendärer Film Week End (1967) als Anti-Kino re-inszeniert wird

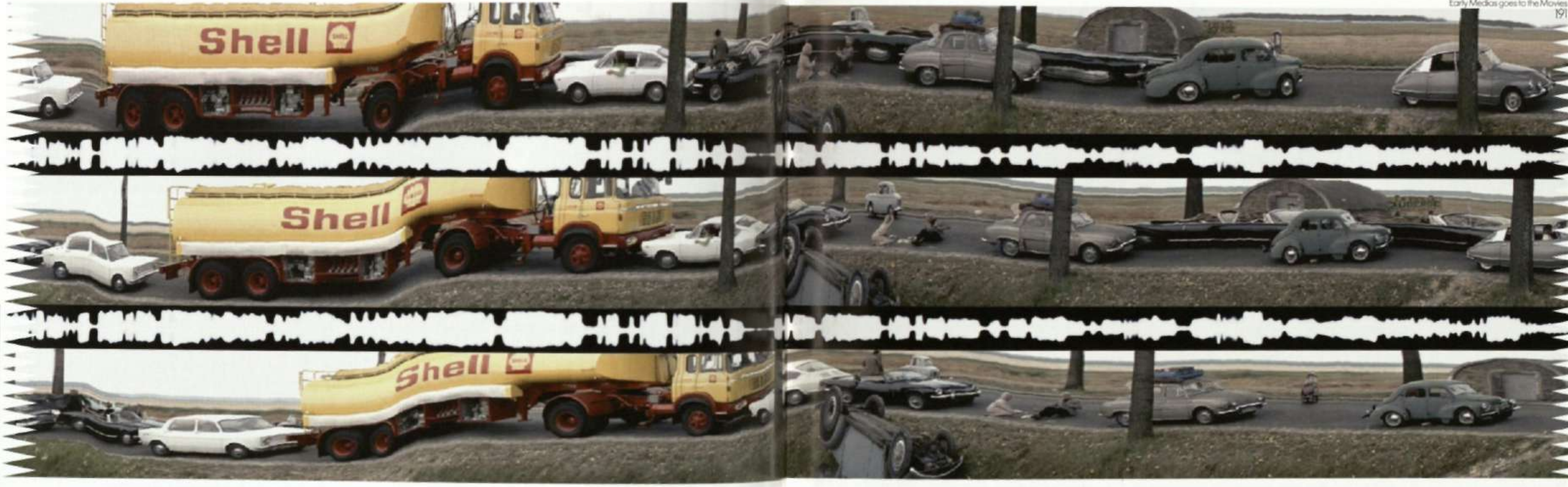
Week End has the distinction of being the most famous film that no one seems to have actually seen. In *Early Media…* I take the three extremely long-duration shots — the traffic jam, the terrorist kidnapping and the dead pan around a bucolic country village and digitally re-cast them as long panoramas. The two horizontal panoramas are reminiscent of the Bayeux Tapestry in the way they conflate space and time; the vertical strip is more abstract along the lines of Marey's time-motion photographs. Max/MSP/Jitter software was used to emulate slit-scan photography and provide multiple time sequence-views of the film's action. In the two horizontal prints, the three views present the time at the left of the frame, from the middle and at the right, as three different re-tellings of the action occurring in the film. Soundtracks are represented graphically as optical film sound patterns or as musical notation. The vertical panorama presents three views from within the frame: the top is the trees receding as the car travels along the country road; the middle is the view in the middle of the windshield, and the bottom is the reflections in the hood of the car.
Accompanying each of these digital prints is a Victorian-era mechanical-visual device that re-inserts, or re-codes, the missing dimensions of time and sound to the scenes, but in ways that are anti-cinematic: the traffic jam scene, originally a tracking shot, allows me to synthesize 3D stereographic images from Godard's one-eyed original, against all auteurial intentions, by using two still images 12 frames apart; the country village panorama, shrunk into a miniature peep-show, is perforated with holes that play a tinkly music box version of the Mozart sonata that comprises the original soundtrack. Godard's hippy-terrorist abduction, as static a chase scene as has ever graced the movies, is made to lurch forward in visual space by means of a novel projection device that renders the image on 16 successive planes within a 25 cm thick block of electrically-controlled glass.

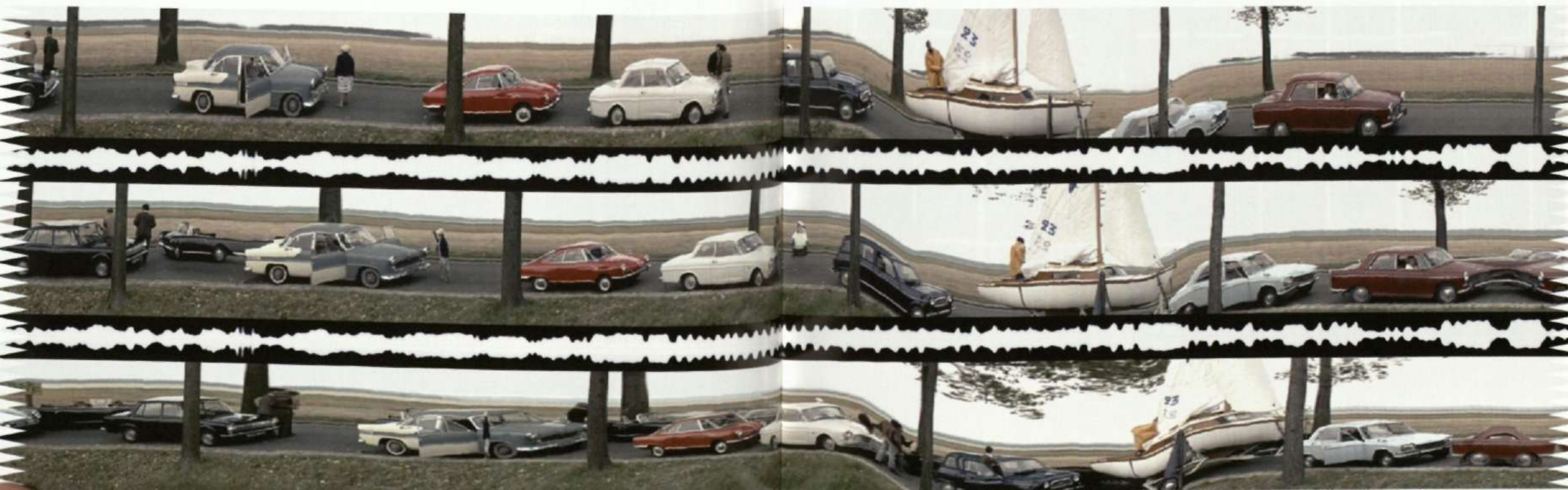
Week End scheint der berühmteste der Filme zu sein, die niemand wirklich gesehen hat. In *Early Media…* nehme ich die drei extrem langen Einstellungen des Films — den Verkehrsstau, die Entführung durch Terroristen und den Schwenk über eine Dorfidylle — und forme sie digital zu langen Panoramen um. Die zwei horizontalen Panoramen erinnern in ihrer Verschmelzung von Raum und Zeit an den Teppich von Bayeux; der vertikale Streifen ist abstrakter, ähnlich wie die Zeit-Bewegungsstudien von Marey. Mithilfe von Max/MSP/Jitter-Software wurden in einem emulierten Slitscan-Verfahren multiple Zeitverlaufsansichten der Filmhandlung angefertigt. In den zwei horizontalen Bildern zeigen die drei Ansichten den Zeitverlauf von der linken Seite, von der Mitte und von der rechten Seite des Bildes als drei verschiedene Nacherzählungen der Filmhandlung. Die Soundtracks werden grafisch als optische Filmtonmuster oder als Notenschrift hinzugefügt. Das vertikale Panorama zeigt drei verschiedene Ausschnitte aus dem Bildkader: oben die bei der Fahrt über die Landstraße vorbeiziehenden Bäume; in der Mitte einen Ausschnitt aus der Windschutzscheibe und unten die Spiegelungen auf der Kühlerhaube des Autos.
Jedem dieser Digitaldrucke ist ein mechanisch-optisches Gerät aus dem viktorianischen Zeitalter beigesellt, das die fehlenden Dimensionen der Zeit und des Tons wieder einfügt oder sie neu codiert, allerdings auf eine Weise, die nicht filmisch ist. Bei der Stauszene, im Original eine Kamerafahrt, konnte ich aus Godards monokularem Original entgegen allen Autorenintentionen 3D-Stereobilder fertigen, indem ich 12 Bilder auseinander liegende Einzelbilder verwendete; das auf eine Miniatur-Peepshow zusammengeschrumpfte Dorfpanorama wurde mit Löchern perforiert, die eine blechern klingende Spieluhr-Version der Mozart-Sonate ergaben, aus der der Originalsoundtrack besteht. Die Entführung durch die Hippie-Terroristen, von Godard als eine der statischsten Verfolgungsjagden der Filmgeschichte angelegt, wird mithilfe eines neuen Projektionsverfahrens, das das Bild in einem 25 cm dicken Block eines elektrisch ansteuerbaren Glases auf 16 hintereinander liegende Ebenen verteilt, im visuellen Raum vorwärts getrieben.

Dimensions:	prints:	121 x 14 x 3 inches;
		107 x 14 x 3 inches;
		51.5 x 14 x 3 inches
	stereo viewer:	8 x 8 x 5 inches;
	stereo cards:	7.25 x 3.5 inches
	music box:	35 x 12 x 7 inches
	projector:	33 x 42 x 53 inches
Materials:	digital prints, stereo viewer, music box, custom volumetric video projection device	

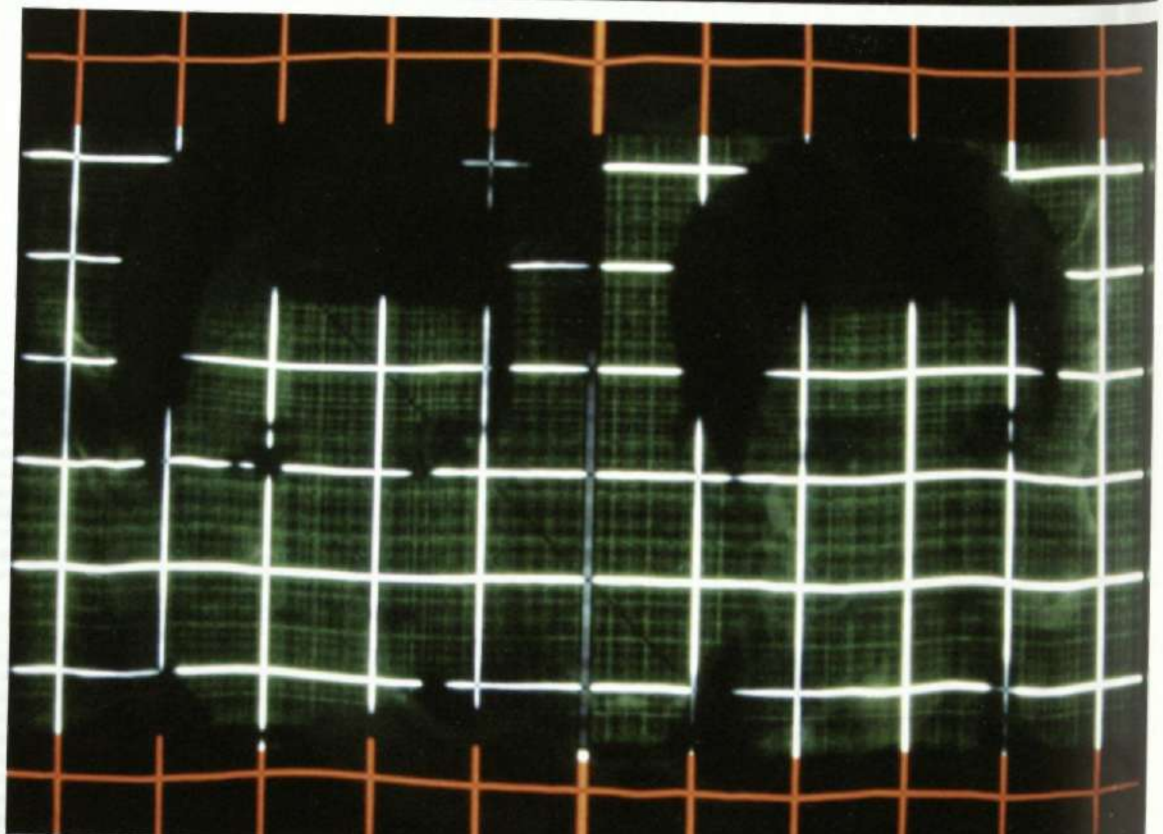
Exhibited at:	Braunstein-Quay Gallery, San Francisco, CA / US	September – October 2008
	Cantor Center for the Visual Arts, Palo Alto, CA / US	September 2009 – January 2010
Thanks to:	Bernie Lubell, Laetitia Sonami, Ruth Braunstein, Shannon Trimble, Stanford University Office of Technology Licensing, Elisabeth Kohnke, Juan Cristobal Cerillo	




Shell
Shell
Shell







Dust

I n s t a l l a t i o n 2009

Images of the faces of missing children are projected piecemeal onto a surface covered with phosphorescent pigment powder. The image accumulates and the trace of faces is left behind as a green glow. Low frequency sounds vibrate the powder, transforming the image into abstract patterns of sound waves. Bilder von den Gesichtern vermisster Kinder werden Stück für Stück auf eine mit einem phosphoreszierenden Puder bestreute Fläche projiziert, wo sie als grün schimmernde Spuren zurückbleiben. Niederfrequente Schallwellen versetzen das Puder in Schwingung und verwandeln die Bilder dadurch in abstrakte Muster.

Everybody collects something. In 1987 I started collecting missing children flyers.

I don't know whether it is just a local phenomenon, but in San Francisco there are mail advertisements featuring local automobile brake and clutch repair joints on one side, and on the other, images, usually a pair of images, of a child who has gone missing. The image on the left is a picture of the child at the time of disappearance, the image on the right is either an age-progression by an artist of what the child might look like now (often decades later) or a picture of the abductor, most frequently one of the child's parents. Sometimes there is no picture on the right — probably the most worrisome case.

These cards are usually the first item of junk mail to throw out, but it was not contrariness that made me start collecting them. Rather, a project beckoned: I was immediately struck by the likeness between the two images — the child and the age-progressed child, or the child and the parent. The project would have been kinetic, media-archaeological, probably inspired by Christian Boltanski's work from that period. Suffice it to say, some inner editor nixed the realization of that one. But I continue, to this day, to collect these most worthless items of junk mail, even as my own horizon of what constitutes surplus information has expanded (only in 1989 did I get my first email account.)

Dust presents a fragment of this collection of likeness-pairs, scanned sequentially into the light-memory of phosphorescent powder. After a few minutes of exposure to the projected image, the powder retains a faint green image of the two faces on its surface, something akin to the »latent image« of photographic film or the veil of memory. Unlike photographic film, though, the image starts to distort. Propelled by low frequency sound vibrations, the powder starts to flow and dance, first distorting the faces and erasing their likeness, then distorting them into patterns* of abstract light in motion, with form and beauty all its own.

* These abstract patterns are known as »Chladni« patterns after the late 18th c. German physicist of that name. They were the first observed and studied images of sound, and their discovery attracted much attention, promising insight into the nature of vibration. Napoleon, the emperor of France, offered a prize to anyone who could rigorously explain the relationship between the visual patterns and the sound. The prize was claimed in the end, by the mathematician Sophie Germain, who determined that the patterns are in fact a consequence of the shape and material of the vibrating surface, rather than the frequency or spectral characteristics of the sound.

Jeder sammelt irgend etwas. Ich sammle seit 1987 Flyer von vermissten Kindern.

Ich weiß nicht, ob es nur ein örtlich begrenztes Phänomen ist, aber in San Francisco gibt es Reklamesendungen, die auf der einen Seite für lokale Reparaturwerkstätten für Bremsen und Kupplungen werben, und auf der anderen Bilder — meist ein Bilderpaar — von vermissten Kindern zeigen. Das linke Bild zeigt das Kind zum Zeitpunkt seines Verschwindens, das rechte zeigt entweder ein künstliches Alterungsbild des Kindes (wie es heute, oft Jahrzehnte später, aussehen könnte) oder das Bild des Entführers (meist ein Elternteil). Manchmal — und das ist wohl der schlimmste Fall — findet sich rechts gar kein Bild.

Diese Reklamesendungen werden in der Regel als erstes weggeworfen. Ich begann sie aber nicht bloß aus Opposition zu sammeln, sondern weil daraus ein Projekt entstehen sollte: Ich war sofort von der Ähnlichkeit der beiden Bilder fasziniert — zwischen Kind und künstlich gealtertem Kind oder zwischen Kind und Elternteil. Es wäre ein kinetisches, medienarchäologisches Projekt geworden, möglicherweise beeinflusst von Christian Boltanskis Arbeiten zu dieser Zeit. Wie dem auch sei: Irgendein innerer Zensor verhinderte die Realisierung. Gleichwohl sammle ich bis heute diese wertlosesten aller Reklamesendungen, auch wenn sich mein Begriff von Junkmail mittlerweile erweitert hat (ich legte mir erst 1989 meinen ersten E-Mail-Account zu).

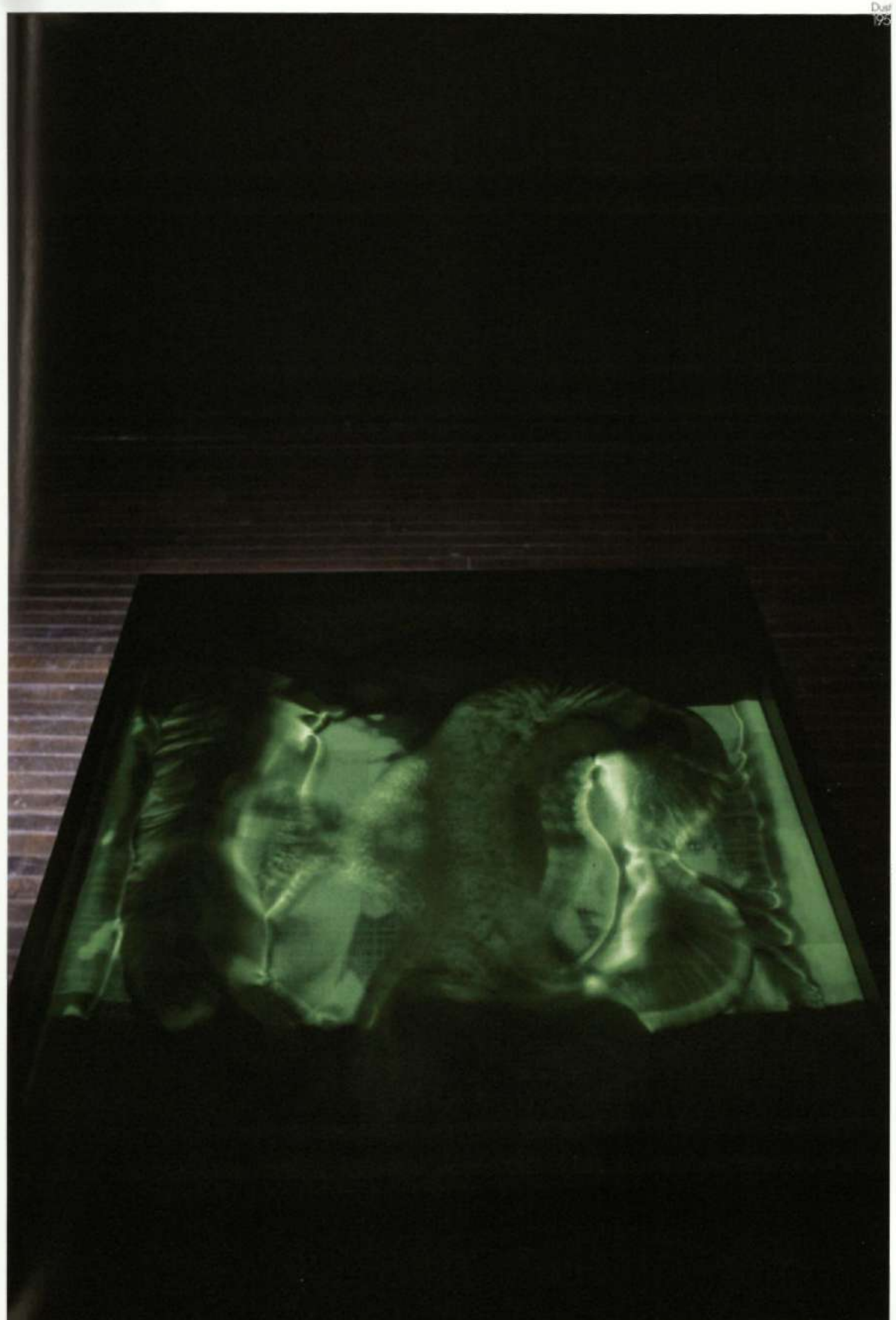
Dust zeigt einen Teil dieser Sammlung von Ähnlichkeitspaaren, hintereinander in das Lichtgedächtnis eines phosphoreszierenden Puders eingebrannt. Nach einigen Minuten Belichtungszeit, speichert das Puder ein blasses grünes Abbild von dem projizierten Gesichterpaar, ähnlich einem »latenten Bild« im Fotomaterial oder dem Schleier der Erinnerung. Anders als im Fotomaterial beginnt sich das Bild hier aber zu verzerren. Unter dem Einfluss niederfrequenter Schallwellen beginnt das Puder zu verschwimmen und tanzen, was zunächst die Gesichter verzerrt und ihre Ähnlichkeit löscht, und sie dann zu Mustern* abstrakten bewegten Lichts von ganz eigener Form und Schönheit zerlegt.

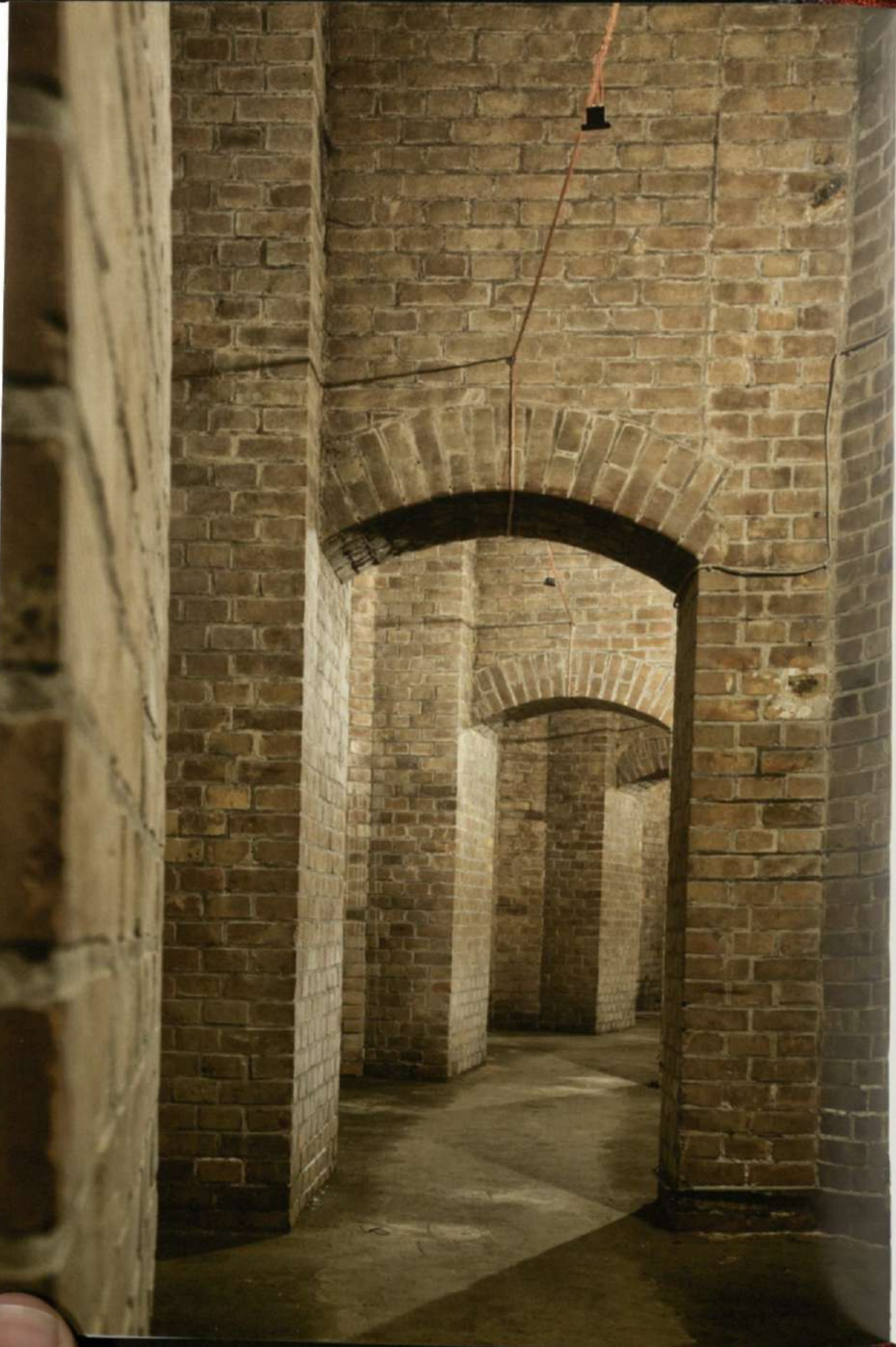
* Diese abstrakten Muster werden – nach dem gleichnamigen deutschen Physiker aus dem späten 18. Jahrhundert — als »Chladnische Klangfiguren« bezeichnet. Sie waren die ersten Klangbilder, die je beobachtet und erforscht wurden, und erregten eine Menge Aufmerksamkeit, weil sie neue Erkenntnisse über das Wesen der Schwingungen versprachen. Napoleon setzte einen Preis für eine exakte Erklärung der Beziehung zwischen den visuellen Mustern und dem akustischen Ereignis aus. Dieser Preis ging schließlich an die Mathematikerin Sophie Germain, die erkannte, dass die Muster eigentlich von der Gestalt und Materialbeschaffenheit der in Schwingung versetzten Fläche abhängen und nicht von der Frequenz und den Spektraleigenschaften des Klangs.

Exhibited at:	The Mattress Factory, Pittsburgh, PA/US	October 2009 – January 2010
	daadgalerie, Berlin, DE	July – August 2010
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	September – November 2010

Dimensions:	variable
Materials:	video projector, computer,
	custom software (Max/MSP/Jitter),
	phosphorescent pigment,
	bass-shakers, sound







Around the World

Site-specific installation 2010

Electromagnetic relays create a volley of clicks as they carry information sequentially through 34 small brick rooms of an old water storage tank in Berlin. Eine Klicksalve, ausgelöst durch elektromagnetische Relais, die Informationen durch die 34 gemauerten Kammern eines alten Wasserreservoirs in Berlin kreisen lassen.

The telegraphic relay is the point of union between the symbolic worlds of marks and noises. This simple electrical device was the key invention that made possible the sending of electrical messages beyond the limited range of 30 km. By regenerating the feeble electrical currents coming over a distance, the relay made possible almost instantaneous around the world communication. But it also made a clicking noise that was used by telegraphers as an audible form of written language, made of sound, but completely apart from spoken language. These telegraphic tappings form the kernel of our communication and information-storage technologies. By using lexical symbols that are simultaneously marks (data) and noises (signals) we encircle the globe in a ring of never ending communication. The difference between the speed of sound and the speed of electromechanical impulses is made palpable by the installation of a 34 relay-long transfer line in the outer chambers of the large water reservoir.

Das Telegrafenrelais ist das Bindeglied zwischen den Symbolwelten der Zeichen und Laute. Dieses einfache elektrische Gerät war der Schlüssel für die elektrische Nachrichtenübermittlung über mehr als 30 km. Durch die Regenerierung des mit der Entfernung schwächer werdenden elektrischen Stroms ermöglichte das Relais eine fast unmittelbare Rund-um-die-Welt-Kommunikation. Es machte aber auch ein Klickgeräusch, das Telegrafisten als hörbare Form geschriebener Sprache verwendeten — einer, die zwar aus Klängen bestand, aber nichts mit der Welt der mündlichen Rede zu tun hatte. Das Klappern des Telegrafen bildet den Kern unserer Kommunikations- und Informationsspeichertechnologien. Mithilfe lexikalischer Symbole, die zugleich Zeichen (Daten) und Laute (Signale) sind, umschließen wir den Erdball mit einem Ring endloser Kommunikation. Die in den äußeren Kammern des großen Wasserspeichers installierte Leitung mit 34 Relais macht die Differenz zwischen der Geschwindigkeit des Schalls und der Geschwindigkeit elektromechanischer Impulse sinnlich spürbar.

Exhibited at: singuhr – hoergalerie, Berlin, DE July – September 2010

Dimensions: site specific
Materials: electromechanical relays, wire, electricity

The Probable Flight Path of AF447

Site-specific installation 2010

A site-specific sound installation that uses random low frequency emissions from corroding metal as audio signals. Eine ortsspezifische Klanginstallation mit Audiosignalen aus zufälligen Tieffrequenzemissionen korrodierenden Metalls.

A strange sound is produced by the action of dissimilar metals, in this case copper and aluminum, corroding in salt water. It contains deep, fractal rumblings, erratic knockings and »spirit-voice«-like mutterings. The title refers to the lost Air France flight that went down in the mid-Atlantic on June 1, 2009. Searches for its black-box recorders were unsuccessful, but, being a construction of aluminum and copper, the wreck of the airplane may well be generating signals much like this piece does, sounds that might be detected with specially designed listening equipment. Four metal-corrosion cells, constructed in small aquariums, each placed in one of the four rings of the space, are individually amplified and sent to a full range speaker and a subwoofer. The low frequency rumbles activate the spaces of the historical water reservoir in Prenzlauer Berg as subsonic waves travel in the air and interfere with each other. The waves act upon 45 sound sensitive circuits that flash long fluorescent tubes when the sound waves exceed a certain power. Their thresholds are set to respond to the sounds from the electrolytic cells, producing a flickering light that corresponds mysteriously with the low frequency sounds.

In Salzwasser korrodierendes Kupfer und Aluminium lassen ein seltsames Klanggebilde aus tiefen, fraktalen Brummtönen, erratischen Klopfgeräuschen und einem Gemurmel wie von »Geisterstimmen« entstehen. Der Titel nimmt Bezug auf das Flugzeug der Air France, das am 1.6.09 mitten über dem Atlantik von Himmel fiel. Die Suche nach seiner Blackbox war bisher erfolglos, aber da es sich um eine Konstruktion aus Aluminium und Kupfer handelt, könnte das Wrack ganz ähnliche Signale wie diese Arbeit aussenden, die sich mit speziell entwickelten Lauschgeräten aufspüren ließen. In den vier Ringen des Wasserspeichers befindet sich je ein Aquarium, das als Metallkorrosionszelle fungiert. Seine Geräusche werden jeweils verstärkt und an einen Breitbandlautsprecher und einen Subwoofer geschickt. Die tieffrequenten Klänge aktivieren mit den sich in der Luft fortpflanzenden und miteinander interferierenden Infraschallwellen die Räume des historischen Wasserspeichers im Prenzlauer Berg. Diese Wellen wirken auf 45 schallempfindliche Schaltkreise, die beim Überschreiten eines bestimmten Schalldrucks lange Leuchtstoffröhren einschalten. Ihre Schwellenwerte sind so festgelegt, dass sie lediglich auf die von den Elektrolytzellen ausgehenden Klänge reagieren, so dass ein flackerndes Licht entsteht, das auf mysteriöse Weise mit den tieffrequenten Klängen korrespondiert.

Exhibited at: singuhr – hoergalerie, Berlin, DE July – September 2010
Dimensions: site specific

Materials: Aluminum, copper, 4 aquariums, salt water, 4 subwoofers, 4 loudspeakers, fluorescent lights, electronics







While the two works presented here, *Around the World* and *The Probable Flight Path of AF447* were initially conceived of as quite separate works in response to the water reservoir site, some further research brought them uncannily together. The terminal point of AF447's flight path intersects an old submarine telegraphic cable between Africa and Brazil. Corporate enterprises of commerce, transportation and communication, it seems, follow certain ley lines after all. If this 19th century cable is still extant, it may provide just the antenna by which the low rumblings of the corroding remains of the aircraft may be located. And so the pieces are now joined together by the data which flows *Around the World* — machine generated texts that are the coded flight plan for that fatal journey, and the sensor warning signals beamed by the doomed Airbus A330 to satellite during its final four minutes of flight.

Obwohl *Around the World* und *The Probable Flight Path of AF447* ursprünglich als völlig eigenständige, auf die Räume des Wasserspeichers abgestimmte Arbeiten konzipiert waren, haben sich bei weiteren Recherchen unheimliche Verbindungen zwischen ihnen ergeben. Die Absturzstelle des Air-France-Flugs 447 überschneidet sich mit einem alten Unterwasser-Telegrafenkabel zwischen Afrika und Brasilien. Große Handels-, Transport- und Kommunikationsunternehmen scheinen also doch bestimmten Ley-Linien zu folgen. Wenn sich dieses Kabel aus den 19. Jahrhundert erhalten hat, könnte es als Antenne für das Aufspüren der tiefen rumorenden Töne dienen, die die Wrackteile beim Korrosionsprozess von sich geben. Und so sind die beiden Arbeiten nun durch die »um die Welt keisenden« Daten verknüpft — maschinengenerierte Texte, die aus der codierten Reiseroute für den tödlichen Flug und den Sensorwarnsignalen bestehen, die der Unglücks-Airbus A330 in den letzten vier Flugminuten an einen Satelliten funkte.

pneuma

Installation 2010

A sound installation with breathing loudspeakers. Eine Klanginstallation mit atmenden Lautsprechern

The bare loudspeaker has long been a visual icon of sound, just as the violin was in former centuries. Nowhere more than in Berlin — the secret capital of sound art — among practitioners of sound installation in the period between the walls, notwithstanding the poor sound quality that results from using an un-boxed loudspeaker as a sound source. Partly in homage, partly to add my own two-cents to the tradition, *pneuma* considers the loudspeaker as a living breathing object. A sleeper of sorts.

Der nackte Lautsprecher ist seit langem eine visuelle Klangikone — etwa das, was die Geige in früheren Jahrhunderten war. Und das nirgendwo mehr als in Berlin (der heimlichen Hauptstadt der Klangkunst), wo er sich seit den 1980er Jahren bei Klangkünstlern trotz der schlechten Tonqualität, die sich aus der Verwendung eines boxenlosen Lautsprechers ergibt, großer Beliebtheit erfreute. Teils als Hommage an diese Tradition, teils als eigener kleiner Beitrag dazu behandelt *pneuma* den Lautsprecher als lebendiges, atmendes Objekt. Eine Art Schläfer.

Exhibited at:	daadgalerie, Berlin, DE	July – August 2010
	Edith-Ruß-Haus für Medienkunst, Oldenburg, DE	September – November 2010

Dimensions:	variable
Materials:	loudspeakers, electronics, boxes, radio-horns, shelves, disk drives, sound



Selected Performances

/ Ausgewählte Performances

A Byte at the Opera collaboration with Jim Pomeroy* 1976

An hour long live-drawing performance during which a lunar landscape is formed by tectonic forces from below and by ethereal forces from beyond. The performance begins with a blank raised stage, 16 feet square and 18 inches high made of sheet rock, with audience seated all around, boxing-match style. A panning video surveillance camera conveys images of the underside of the stage to a video monitor. One performer, located below the stage on a wheeled dolly, moves around, uses strong magnets to move objects above the stage, power tools to drill holes in the surface, ejects clouds of colored chalk dust and cans of silly string that fall back on the surface to create a chance drawing.

The other performer, seated on a hovering platform suspended over the stage, uses a Kim-1 computer to produce sounds. The computer also is connected to bean-filled loudspeakers mounted into the stage surface. By sending timed pulses to a speaker, a single bean can be ejected, as in an ink-jet printer. By sending a train of pulses, speakers can create bean-volcanoes that erupt over the surface, adding to the drawing. At the performance's end, the subterranean performer uses a saber-saw to cut his way through the stage and rescues the aerial performer from the suspended platform.

* Jim Pomeroy (1945–1992) was an innovative artist, performer, teacher and scholar. He was considered a leader in defining the realm of conceptual art during the 1970s and 80s, and worked in a wide variety of media, including photography, performance, installations, computer graphics, video art, and stereography. Pomeroy performed and exhibited his work all over the world and was the recipient of many honors, awards, and fellowships. At the time of his death, he was teaching video and new genres at the University of Texas at Arlington.

Eine einstündige Live-Zeichenperformance in der durch tektonische Kräfte von unten und ätherische Kräfte von oben eine Mondlandschaft erzeugt wird. Die Performance beginnt mit einer leeren, knapp 5×5 Meter großen und 1/2 Meter hohen Bühne aus Rigipsplatten, um die das Publikum wie um einen Boxring sitzt. Eine ständig hin- und herschwenkende Videoüberwachungskamera überträgt Bilder von der Unterseite der Bühne auf eine Leinwand. Ein Performer fährt auf einem Rollwagen unter der Bühne herum und bewegt dabei mit starken Magneten Objekte über die Oberfläche, bohrt mit Bohrmaschinen Löcher in sie, wirft daraus gefärbten Kalkstaub und Dosen mit Luftschlangenspray, die beim Zurückfallen auf die Bühne zufällige Linien hinterlassen. Der zweite Performer sitzt auf einer über der Bühne schwebenden Plattform und erzeugt mit einem Kim-1-Computer Sounds. Der Computer ist mit in die Bühne eingelassenen und mit Bohnen gefüllten Lautsprechern verbunden. Mit exakt getimten Einzelimpulsen lassen sich wie bei einem Tintenstrahldrucker einzelne Bohnen auswerfen, mit einer Impulsfolge regelrechte Bohnenvulkanausbrüche auslösen, die alle zur Zeichnung beitragen. Am Ende der Performance schneidet sich der unterirdische Performer mit einer Stichsäge durch die Bühne und rettet den überirdischen Performer von seiner Plattform.

* Jim Pomeroy (1945–1992) war ein innovativer Künstler, Performer, Lehrer und Wissenschaftler, der in den 1970er und 1980er Jahren als eine der prägenden Figuren für das Feld konzeptueller Kunst galt. Er arbeitete in unterschiedlichsten Medien, u.a. Fotografie, Performance, Installation, Computergrafik, Video, Stereografie. Pomeroys Arbeiten wurden weltweit ausgestellt und aufgeführt und er wurde dafür vielfach mit Ehrungen, Preisen und Stipendien ausgezeichnet. Zum Zeitpunkt seines Todes lehrte er Video und neue Genres an der University of Texas in Arlington.

Beneath the Numbered Sky 1985

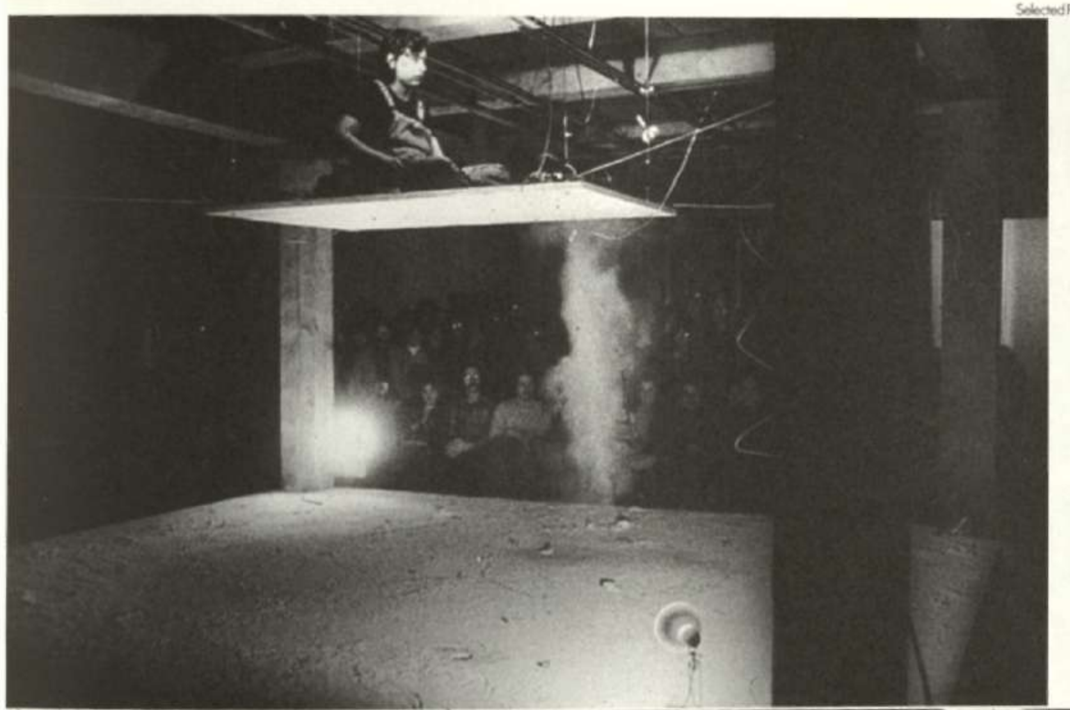
Beneath the Numbered Sky is a transformative audio work based on an Indonesian folksong. As darkness falls, a mother sings her children to sleep, weaving a spell of protection around the home. As she sings, she is transformed into a large bird and soars through the starry heavens with her lover. The work was created by first adding a synthesizer accompaniment to the original vocal solo. All other sounds were created out of the voice itself, using digital signal processing algorithms that I wrote and programmed for the Texas Instruments TMS320 computer. The title was intended to convey the image of a vast and inhabited numerical space in which the allegorical space of the narrative intersects the acoustic space of the vocal tract.

Beneath the Numbered Sky ist eine auf einem indonesischen Volkslied beruhende, sich langsam verwandelnde Audio-Arbeit. Bei Einfall der Dunkelheit, singt eine Mutter ihre Kinder in den Schlaf und hüllt das Haus in einen Schutzzauber. Während sie singt, wird sie zu einem großen Vogel und erhebt sich mit ihrem Geliebten in den Sternenhimmel. Für die Arbeit erhielt die ursprüngliche Solostimme zunächst eine Synthesizerbegleitung. Alle anderen Sounds wurden mithilfe digitaler Signalverarbeitungsalgorithmen, die ich für den Texas Instruments Computer TMS320 schrieb, aus der Stimme selbst entwickelt. Der Titel sollte das Bild eines riesigen unbewohnten Zahlenraums evozieren, in dem sich der allegorische Raum der Erzählung mit dem akustischen Raum des Vokaltrakts trifft.

The Power of Suggestion 1986–89

The Power of Suggestion is a synthetic voice song-cycle based on the melodic speech patterns of »convincing« voices — hypnotists, evangelists and salesmen. Several of these pieces are performed using a modified »Power Glove« with which I conduct the voice using hand gestures.

The Power of Suggestion ist ein Liederzyklus für eine synthetische Stimme auf der Basis der Sprechmelodien von »Überzeugungstätern« — Hypnotiseuren, Predigern, Verkäufern. Bei einigen der Stücke wird die Stimme mit einem modifizierten »Power Glove« mittels Handzeichen dirigiert.



A Byte at the Opera, performance at 80 Langton St, San Francisco, January 1977 ↑→





CKT, performance at South of the Slot, San Francisco, 1974

Mechanization Takes Command — Verses from Giedion's Bible collaboration with Laetitia Sonami* 1990

An hour-long performance audiovisual performance based on Sigfried Giedion's 1946 book *Mechanization Takes Command*. Sensor gloves, interactive props and visual projections combine to form a panorama of machines, animals and humans, accompanied by sounds and voices, live and mechanized.

Eine einstündige audiovisuelle Performance auf der Grundlage von Sigfried Giedions Buch *Die Herrschaft der Mechanisierung*. Mit Sensorhandschuhen, interaktiven Requisiten und Bildprojektionen entsteht ein Panorama aus Maschinen, Tieren und Menschen, begleitet von echten wie mechanischen Klängen und Stimmen.

*Laetitia Sonami (*1957) is a composer, performer and sound installation artist who designs and builds her own instruments. Her signature instrument, the *lady's glove*, allows her to control sounds, mechanical devices, and lights in real-time.

*Laetitia Sonami (*1957) ist eine Komponistin, Performerin und Klangkünstlerin, die mit selbst entwickelten und gebauten Instrumenten arbeitet. Mit dem *Lady's Glove*, ihrem Hauptinstrument, kann sie Klänge, mechanische Geräte und Licht in Echtzeit steuern.

See also essay **Mechanization Takes Command** → 71

The Lecture of Comrade Stalin — Synthesis 1998

The voices of Joseph Stalin, Lady Macbeth of Mtsensk, Adelina Patti, Elvis Presley and Spike Jones, morph and commingle in radiophonic space.

Die Stimmen von Josef Stalin, Adelina Patti, der Lady Macbeth von Mzensk, Elvis Presley und Spike Jones verändern und mischen sich im radiophonen Raum.

Torch Song 2002

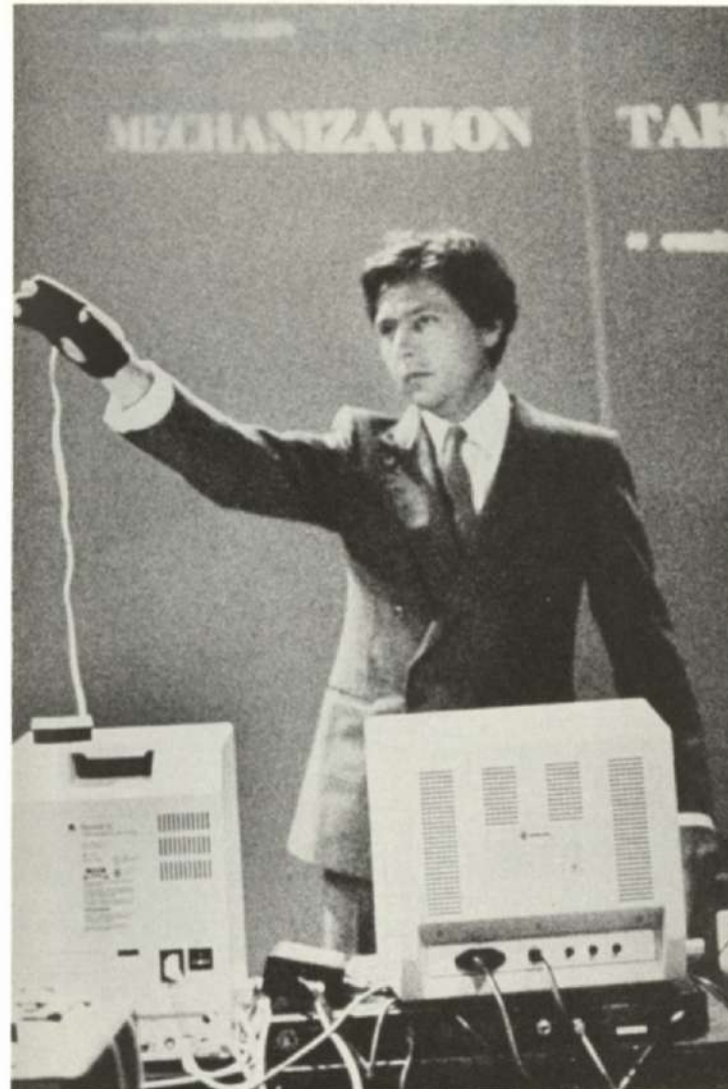
The performer deploys a variety of archaic and »impossible« audio media, including real-time shortwave radio transmissions, Edison cylinder recordings, flame loudspeakers and manometric flame oscilloscopes to conduct a radiophonic seance with the voices of dead dictators.

Der Performer hält mithilfe einiger archaischer und »unmöglicher« Audiomedien wie Live-Kurzwellenübertragungen, Edison-Walzenaufnahmen, Flammenlautsprechern und manometrischen Flammenoszilloskopen eine radiophone Séance mit den Stimmen toter Diktatoren ab.

The Appearance of Evil 2004

The performer holds two 80 cm diameter round white discs. These discs serve as projection screens to receive images of a candle flame recorded against a backdrop of video noise, and also as sound reflectors that steer ultrasonic beams of sound from ultra-directional loudspeakers (Holosonics Audio Spotlights) that project the audible voices of Mussolini and Stalin into the audience.

Der Performer hält zwei weiße Scheiben von 80 cm Durchmesser, die als Projektionsflächen für die Bilder einer Kerzenflamme dienen, die vor einem Hintergrund aus Videorauschen aufgenommen wurde. Zugleich werden die Scheiben als Schallreflektoren für die Ultraschallstrahlen von Richtlautsprechern (Holosonics Audio Spotlights) verwendet, mit denen die hörbaren Stimmen von Mussolini und Stalin ins Publikum projiziert werden.



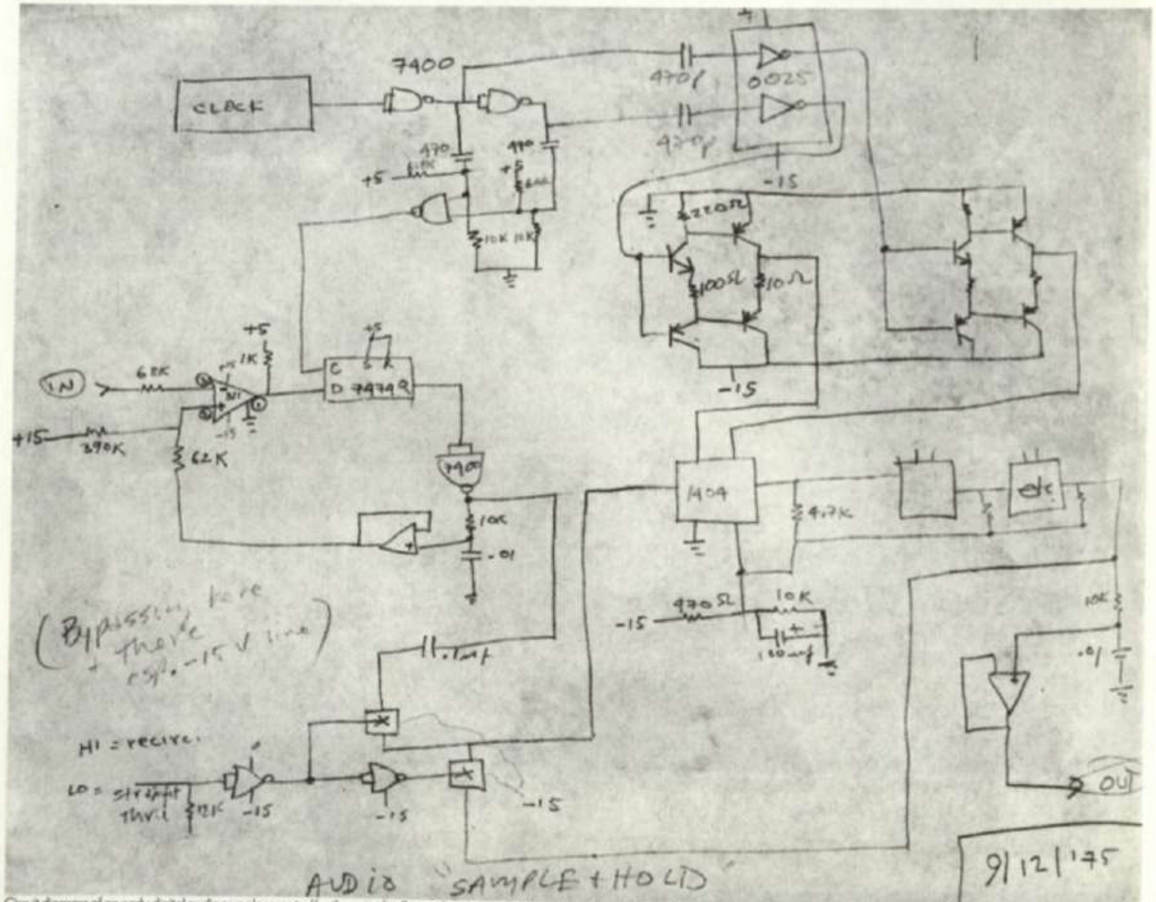
Mechanization Takes Command, performance at New Langton Arts, San Francisco, 1990



→ **Eenie Meenie Chillie Beenie**, performance at Union Square, San Francisco, 1983



Et Tu, Klaatu, performance at Mills College CCM, Oakland, 1979



Circuit diagram of an early digital audio sampler created by the artist for **String Quartet for Solo Viola and Digital Delay Lines**, 1975

Writings 1988—2004
/ Schriften

Alien Voices

1988

God is perhaps not so much a region beyond knowledge as something prior to the sentences we speak. — Michel Foucault

Hidden beneath speech's words and music's melodies I hear the singing of a voice more ancient than language. Brain's secret convulsions making muscles articulate, shaking the world with a song now lost to us except perhaps in laughter, giving birth at last to a duality of sound and meaning. Now we can write or read, compose or listen, speak and converse even about our words themselves. No longer are we aware that as we speak our voices rise and fall, following the deeper contours of speech melodies that prefigure our sense and our meanings. Even our music ceased long ago to sing these melodies, following instead the steady course of harmonic progression. Still, as we read a text, we must reconstruct the melodies of the writer to grasp the meaning. Still, we code our feelings in the melody of our speech. And still, as our leaders talk, hearing not the words but the music, we sing our quiet selves into a sleep of understanding. The whistles of the birds in our nose, the creaking door which closes a phrase, the measured pause which precedes a two-beat putdown — all these underlie the choice and order of our words. These are the ghosts in grammar's basement.

Alien Voices makes you aware of the melodic contours of your voice. By a process of computer analysis and re-synthesis the melodic line of spoken language is removed, modified or replaced with other patterns and played on a music synthesizer. Along the way, the original voice becomes more or less disembodied, but retains much of the original spirit and meaning. The computer analysis model can alter voicing — changing the speech into drones or whispers, pitch — raising or lowering, inverting or exaggerating the speech-melody without altering the speed, as well as a variety of other effects, many of which sound unfamiliar but agree with the kinematics of the vocal tract. By experimenting with the different settings, you can discover to what extent you rely on melody to understand meaning and perhaps speculate on the linguistic content of musical melody.

Gott ist vielleicht weniger ein Jenseits des Denkens als ein bestimmtes Diesseits unserer Sätze. — Michel Foucault

Unterhalb der gesprochenen Sprache und der Melodien der Musik höre ich eine Stimme singen, die älter ist als die Sprache: die geheimen Konvulsionen des Gehirns, welche Muskeln in Bewegung versetzen, die Welt mit einem Lied aufrütteln, zu dem wir heute höchstens noch im Lachen Zugang haben, und schließlich in der Dualität von Klang und Bedeutung enden. Heute können wir schreiben oder lesen, komponieren oder zuhören, und uns sogar über die Worte selbst unterhalten. Wir sind uns nicht mehr bewusst, dass unsere Stimmen beim Sprechen steigen und fallen, den tiefer liegenden Konturen von Sprechmelodien folgen, die dem Sinn dessen, was wir sagen, vorgelagert sind. Selbst die Musik singt schon längst nicht mehr diese Melodien, sondern folgt stattdessen den festen Regeln der harmonischen Fortschreitung. Gleichwohl müssen wir beim Lesen eines Textes die Melodien des Verfassers rekonstruieren, wenn wir seinen Sinn erfassen wollen. Gleichwohl müssen wir unsere Gefühle in die Sprachmelodie einschreiben. Gleichwohl wiegen wir uns bei den Reden unserer politischen Führer in den Schlaf des Verstehens, indem wir nicht auf ihre Worte, sondern ihre Musik hören. Das Vogelgepfeife in unserer Nase, das Türknarren, mit dem wir einen Satz abschließen, die wohlgesetzte Pause vor einem beleidigenden Zweiheber — all das bildet die Basis für die Wahl und Anordnung unserer Worte. Es sind die Geister im Keller unserer Grammatik.

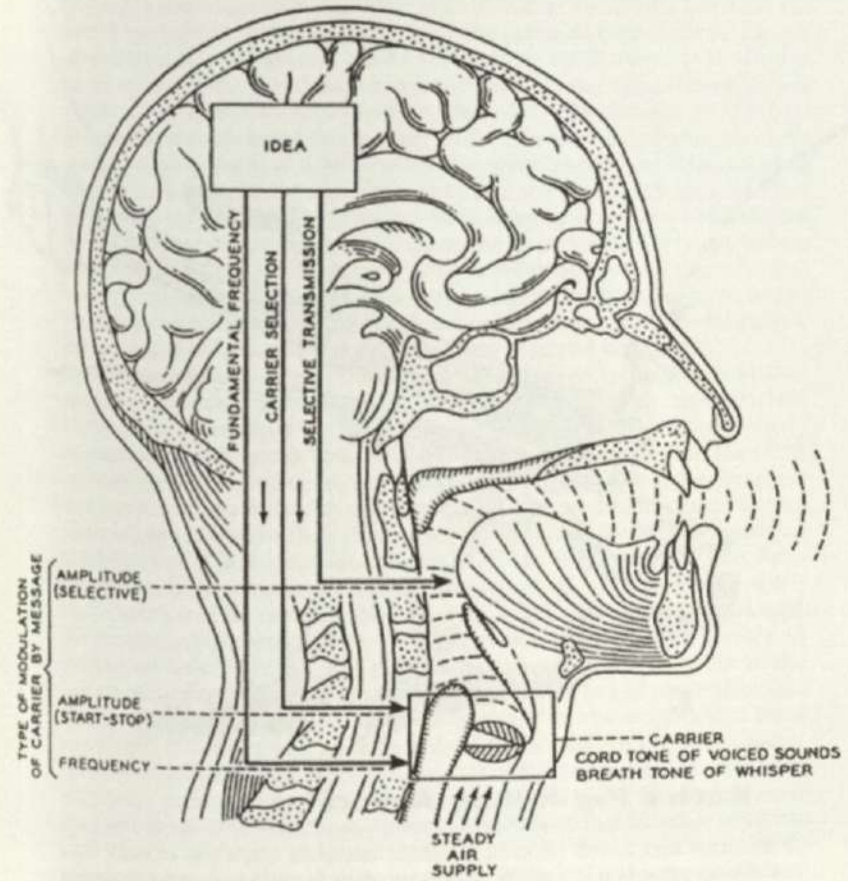
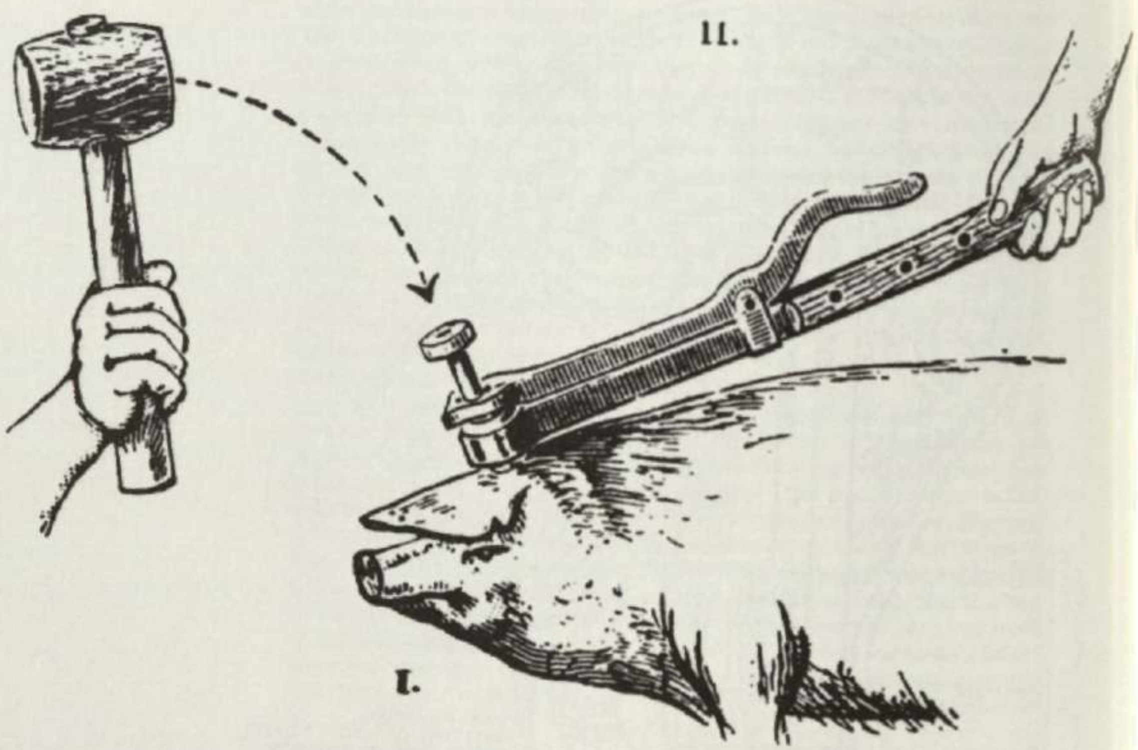


FIGURE 8-35. The vocal system as a carrier circuit. (From Dudley [210].)

Alien Voices erinnert uns an die melodischen Konturen unserer Stimme. Mithilfe computergestützter Analyse- und Resyntheseprozesse wird die Melodielinie mündlicher Äußerungen ausgefiltert, modifiziert oder durch ein anderes Muster ersetzt und danach mit einem Synthesizer wiedergegeben. Dabei verliert die ursprüngliche Stimme mehr oder weniger ihren Körper, behält aber viel von ihrem ursprünglichen Geist und Sinn. Mit der Computeranalyse kann man den Grad der Stimmhaftigkeit verändern — die Stimme summen oder flüstern lassen —, die Tonhöhe anheben oder absenken, die Sprechrichtung umkehren oder die Sprachmelodie überzeichnen, ohne dabei das Tempo zu verändern. Dazu kommen eine Reihe weiterer Effekte, von denen zwar viele fremdartig klingen, sehr wohl aber mit der Kinematik des Sprechapparats übereinstimmen. Durch das Experimentieren mit unterschiedlichen Einstellungen kann man herausfinden, wie weit das eigene Sinnverständnis von der Melodie abhängt, und vielleicht auch darüber spekulieren, was der sprachliche Gehalt einer musikalischen Melodie ist.



Koch's Pig Killing Apparatus.

Mechanization Takes Command

1990

Machines stand apart from us much as we imagine we stand apart from nature. They appear as the embodiment of our powers of abstraction, our understanding of ourselves and the structure of the world. As we gaze around us we see everywhere the transformation caused by machines. In our farms, cities and industrial wastelands, in our thoughts, relationships and dreams. The machine has become for us a sort of intermediary in a dialog with ourselves, a dialog that is at times profound, sometimes fatuous. The machine lends a material semblance of objectivity to our fleeting thoughts and our accommodating perceptions. Each machine in its age is a spinner of illusions and a standard of what is objective truth and reality. From the assumption that the machine is objective arises, too, the belief that the actions resulting from the machine are objective. The use of »smart bombs« that incorporate sensors and guidance systems to seek out targets now justify the killings of thousands of people as »collateral damages«. How did we get here?

While war raged in Europe, Swiss architect and historian Sigfried Giedion roamed the remote backwaters of American patent archives, exploring and charting the anonymous history of the age of mechanical invention. In 1947 he published his landmark treatise *Mechanization Takes Command*. The title's active present tense conveys the once-fresh immediacy of the bygone mechanical age that spanned the 19th century, during which human invention overwhelmed and re-defined the human being. Contrasting the natural resources, availability of skilled labor, and historical proclivities of Europe and America, he examines, chapter by chapter, the effects of mechanization on the various realms of human endeavor. The lock and key, bread baking, slaughterhouses, furniture and the very notion of comfort, kitchen appliances, and bathing are among the subjects of Giedion's scrutiny. Ever attentive to the impact of mechanization on the organic world, our lives and our bodies, Giedion's critical perspective surpasses mere historical documentation, teleological theory, or scientistic adulation: he bares the roots of the many contradictions underlying our current global crises of life and humanity versus the corporate mechanism and the ruling taste. *Mechanization Takes Command* is a sourcebook of problems, solutions, and solutions that became problems. Our sciences rely upon technical intermediaries to detect and measure dimensions we cannot observe with our senses. While it is no longer possible to conceive of a science without machines, we encounter everyday machines without science — and here is the real science-fiction. Daily we witness a panorama of seemingly autonomous machines which have colonized our planet, from the innocent improvisations of child- and folk-technology to the haphazard bricolage of our great industrial complexes. The blindness, power and the collective lack of any purposeful direction allow these great cumulative machineries to inexorably erode a world whose wholeness we cannot grasp and have only recently begun to appreciate.

We now linger at the end of the electronic/information age. Perhaps it is our indecision that keeps us from choosing one of two equally threatening options: abandoning our tired paradigms to embrace a new more whole conception of ourselves and the environment, or sticking to our guns and annihilating it. It may now be elucidating to reconsider the path taken by our predecessors in the bygone age of machines. Giedion has considered the machine as dictator of social and ethical values, of aesthetics, as a mirror of nature and as model of mind. All these things were variously attributed to or projected onto the machine during its heyday a century and a half ago. Within these patterns there may lie habits which our culture will repeat even as paradigms shift.

It seems that in our modern western culture, technology assumes the position of the »intermediary«, the mythical, magical or oracular fetish onto which

we project an inner dimension which we cannot express directly and from which, in turn, we seek answers about the world and our place in it. Machines afford us a sort of trinity of dialog among self-as-subject / machine / self-as-object. The barber's chair, the Barbie doll, the desktop computer, the smart bomb — each mute object is a participant in a discussion of which it understands nothing. Our obsession with keys, codes, special control buttons, may be a contemporary manifestation of special formulae, incantations that we once used to communicate with the unknown, the »disembodied powers«. Could it be that the »genii loci«, woodland spirits and others we once revered to increase our understanding and participation in our environment are now imbedded in technology? Does this ever present need to validate oneself through reiteration of technology come out of desperation or fear of »emptiness«? (In a recent account, a hostage in Iranian prisons described recreating the mathematical formulae and theorems he knew using only breadcrumbs and dust. Never did he consider exploring his loneliness, helplessness and the lack of any possibility of expressing himself.)

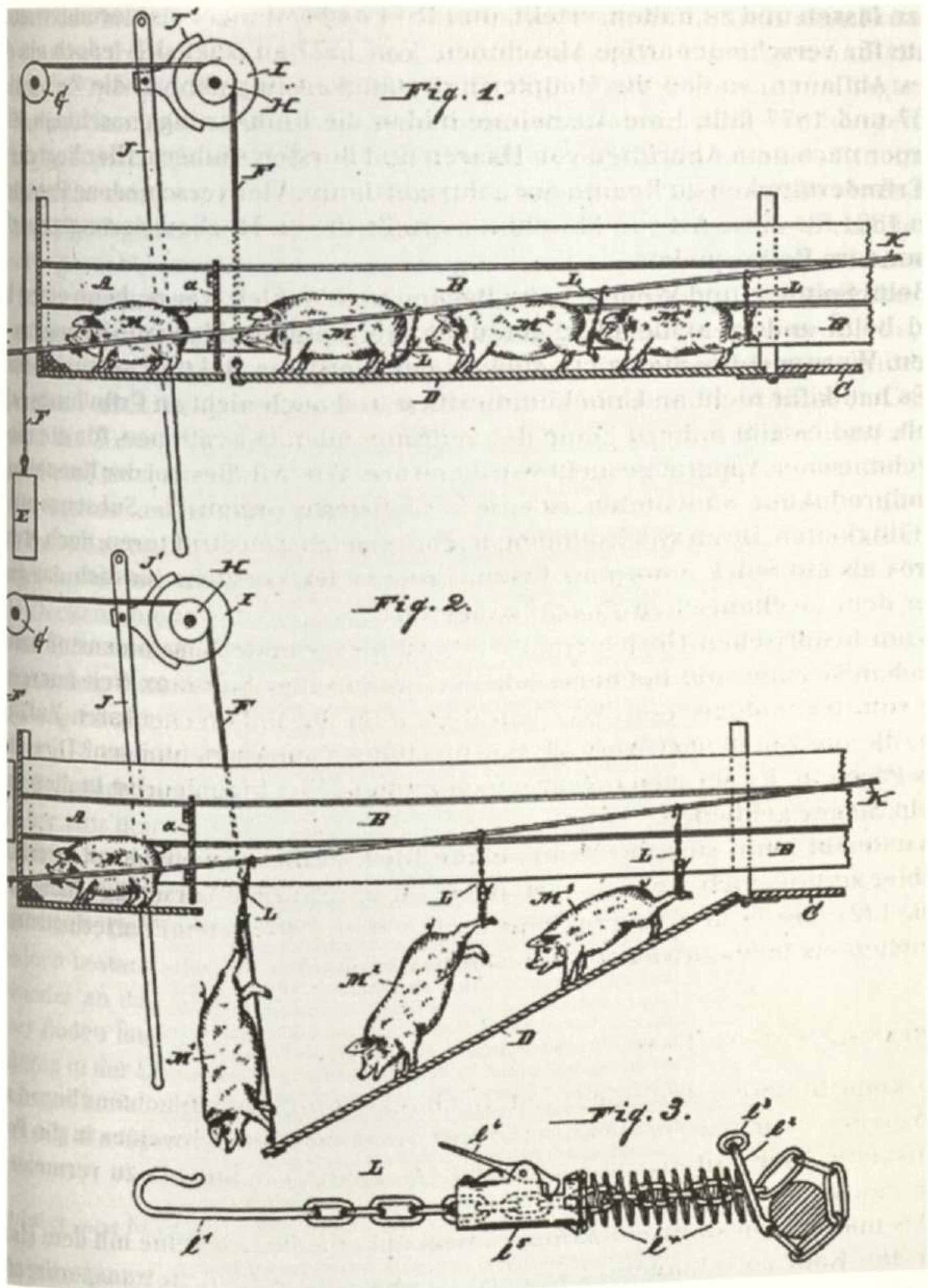
For the present performance[1] we have chosen a few of the more quirky or romantic passages from Giedion's text to set to music: the chapters covering slaughter, the mechanics of the hand, and bathing form the nucleus of our text. By a process of computer analysis, we convert the naturally occurring melodies and rhythms of the speaking voice (unconscious habits) into musical material. Applying the results to digital speech and music synthesizers and samplers, we have created a series of »songs« or settings which both derive from and portray the subject matter of Giedion's writings. The sounds of animals, machines and the echoes of now distant memories are blended and fused intimately with the sounds of words.

1
This text was written to accompany a collaboration of the same title with Laetitia Sonami
→204

The use of computers and synthesizers in the present performance serve to exaggerate the dissociation between the minimalism of gestural and performative actions and the massive control of the experience suggested by the sound and imagery. The material, not the performer, now carries the richness of experience toward its target. Like modern architecture, audio technology gives us a means to create an elaborate set of transparencies that coexist in time and space. Like architecture, audio always retains a sense of the illusory, creating spaces which, without our awareness, modify our sense of self. The controls at hand, however, allow »painless« instantaneous disintegration without smart bombs. Again, divorcing of action from result squelches opposition.

There is an irony in the contrast between natural live voice and synthesized voice. The voice, once it is taken away from the body and reconstituted as a being without corporeal substance, without status or place, without viewpoint, without the fleshy vulnerability a bared throat offers, is re-incarnated as a new clarified being. Perhaps a voice of authority, or an oracle that can speak from beyond the grave. It gives us a deliriously false confidence, this chest resonance without chest, these nasals without nose, plosives without lips or tongue, this singer of songs-without-throats. The voice, encountering the machine suffers the same series of dislocations which are perpetrated upon the animal bodies in the slaughterhouse. Unlike the random destruction of a road-kill, they are distilled, transformed — purified and abstracted into something else. Here we have excised melodies like bodily organs, trimmed away the fat and gristle of meaning to reveal underlying harmonic and rhythmic skeletons. We have filleted and sliced the synthetic voice away from its bones only to reconstitute it again in a new guise, to resurrect it as a god, daemon, or spirit. Who is saying these things? Am I the only one who hears these voices?

Giedion has created a panorama of found images, creating a fertile visual dialectic — images by Marey, the Gilbreths and Muybridge appear opposite Duchamp, Ernst and Klee, all illustrating the encoding of human motion in shape and form. 19th century engravings of McCormick's reaper, patent drawings of animal skinning devices which were never really practicable, accompany us on our walk through Giedion's anonymous history. The over 500



illustrations which accompany the text of *Mechanization Takes Command* constitute a brilliant kaleidoscope of visual anthropology, revealing paradoxes, hidden agendas and sheer blind optimism as they appear in successive turns along our path. We have incorporated these etchings and line drawings into the projections for our performance along with photographed images in color, again pointing out the parallels and contradictions between the mechanical and the actual, that which is meant to be seen but also what cannot be hidden.

Mechanization Takes Command 1990

Maschinen unterscheiden sich so sehr von uns wie wir uns von der Natur zu unterscheiden glauben. Sie erscheinen als Verkörperung unseres Abstraktionsvermögens, unseres Selbstverständnisses und des Aufbaus der Welt. Wenn wir um uns blicken, sehen wir überall die durch Maschinen verursachten Veränderungen. In unseren Bauernhöfen, Städten, Industriewüsten, in unseren Gedanken, Beziehungen und Träumen. Die Maschine ist für uns zu einer Art Vermittler in einem Dialog mit uns selbst geworden, einem manchmal tiefsinnigen, manchmal sinnlosen Dialog. Die Maschine verleiht unseren flüchtigen Gedanken und umstandsbedingten Wahrnehmungen einen materiellen Anschein von Objektivität. Jede Maschine erzeugt in ihrem Zeitalter Illusionen und stellt Normen dafür auf, was objektive Wahrheit und Realität ist. Die Annahme, die Maschine sei objektiv, zieht auch die Überzeugung nach sich, dass die von ihr hervorgebrachten Werke objektiv seien. Die Verwendung »intelligenter Bomben«, die sich mit eingebauten Sensoren und Führungssystemen selbsttätig ihre Ziele suchen, legitimiert das Töten tausender Menschen als »Kollateralschaden«. Wie sind wir so weit gekommen?

Während in Europa der Krieg tobte, durchsuchte der Schweizer Architekt und Historiker Sigfried Giedion die hintersten Archive der amerikanischen Patentämter, um die anonyme Geschichte der mechanischen Erfindungen zu dokumentieren. 1947 publizierte er seine richtungsweisende Abhandlung *Mechanization Takes Command* [deutsch: *Die Herrschaft der Mechanisierung*]. Der im Präsens gehaltene Titel vermittelt etwas von der einstmaligen Unmittelbarkeit des mechanischen Zeitalters im 19. Jahrhundert, in dem von Menschen gemachte Erfindungen über das menschliche Dasein hereinbrachen und es neu definierten. In einer Gegenüberstellung der natürlichen Ressourcen, der Verfügbarkeit qualifizierter Arbeitskraft und der historischen Errungenschaften Europas und Amerikas untersucht er — Kapitel um Kapitel — das Eindringen der Mechanisierung in die verschiedenen Bereiche des menschlichen Lebens: Schloss und Schlüssel, Brotbacken, Schlachthäuser, Möbel und alles, was man unter Komfort versteht, Küchengeräte und Badegewohnheiten. Mit seinem aufmerksamen Blick für den Einfluss der Mechanisierung auf die organische Welt, unser Leben und unsere Körper geht Giedions kritische Studie über die rein historische Dokumentation, teleologische Theorie oder szientistische Lobhudelei weit hinaus: Er entblößt die Wurzeln der zahlreichen Widersprüche, die den gegenwärtigen globalen Krisen zugrunde liegen, welche sich aus dem Konflikt des Lebens und der Menschheit mit dem Mechanismus der Industrie und dem herrschenden Geschmack ergeben. *Die Herrschaft der Mechanisierung* ist ein Quellenwerk für Probleme und Lösungen — und für Lösungen, die zu Problemen wurden.

Unsere Wissenschaften verlassen sich auf technische Mittel zur Erfassung und Messung von Dimensionen, die wir mit unseren Sinnen nicht wahrnehmen können. Während wir uns eine Wissenschaft ohne Maschinen gar nicht



457. Zurück zur Natur: Prießnitz' Dusche in den schlesischen Wäldern. *Eine Quelle wird eingefaßt, und das Wasser wird durch halboffene Rohre geleitet. Man duscht sich auf einer über den Bach herausragenden Holzplattform. Ein halbes Jahrhundert nach Rousseaus »Zurück zur Natur« förderte die romantische Auffassung die Verbreitung der Wassertherapie von Prießnitz und anderen.* (*Philo vom Walde,* Vincenz Prießnitz, *Prag,* 1884)

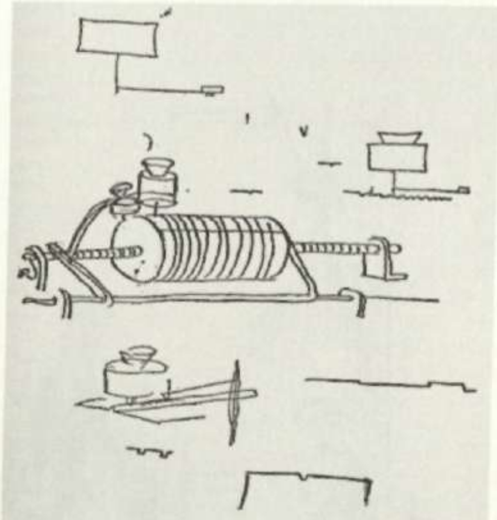
mehr vorstellen können, stoßen wir jeden Tag auf Maschinen ohne Wissenschaft — und da liegt die wahre Sciencefiction. Tagtäglich haben wir es mit einem Panorama scheinbar autonomer Maschinen zu tun, die unseren Planeten kolonisiert haben — von den unschuldigen Improvisationen der Kinder- und Alltagstechnik bis zu unseren planlos zusammengebastelten großen Industriekomplexen. Aufgrund von Blindheit und Macht und in allgemeiner Ermangelung jeglicher Zielrichtung können diese großen Maschinenkomplexe unerbittlich eine Welt zerfressen, deren Ganzheit wir nicht zu überblicken vermögen und die wir erst vor kurzem zu schätzen begonnen haben.

Wir halten nun am Ende des Elektronik- und Informationszeitalters. Vielleicht ist es unsere Unentschlossenheit, die uns daran hindert, eine von zwei gleichermaßen bedrohlichen Alternativen zu wählen: die, unsere alten Paradigmen aufzugeben und uns eine neue ganzheitlichere Auffassung unserer selbst und unserer Umwelt zuzulegen, oder uns weiter an unsere Waffen zu klammern und sie zu vernichten. Vielleicht ist es aufschlussreich, sich heute erneut den Weg anzusehen, den unsere Vorfahren im längst vergangenen Maschinenzeitalter eingeschlagen haben. Giedion betrachtete die Maschine als etwas, das soziale, ethische und ästhetische Werte diktiert, aber auch als Spiegel der Natur und als Modell des Geistes. Alle diese Dinge wurden der Maschine in ihrer Blütezeit vor eineinhalb Jahrhunderten zugeschrieben oder auf sie projiziert. In diesen Mustern verbergen sich vielleicht Gewohnheiten, die unsere Kultur wiederholt, auch wenn sich die Paradigmen verschieben.

Die Technik scheint in unserer modernen westlichen Kultur die Stellung des »Mittlers« einzunehmen, eines mythischen, magischen oder orakelhaften Fetischs, auf den wir etwas Inneres projizieren, das wir nicht direkt ausdrücken können, und bei dem wir umgekehrt Antworten über die Welt und unseren



A photograph of Edison taken at 5:30 A.M. on June 16, 1888, after intensive work on an improved phonograph. Note the wax cylinders in foreground and electric battery at left.



"EDISON'S FIRST SKETCH OF THE PHONOGRAPH"



FIGURE 15. The mnemonic body transformed: Edison talking doll (1890). The doll remembered "Mary Had a Little Lamb"; in so doing it kept remembering the invention of the phonograph.



Clichés Physique Populaire (Flammarion)

Inscription phonographique des sons musicaux sur le phonographe perfectionné Edison

Essay in lieu of a Sonata

1993

Reflections on The Edison Effect — a series of audio installations consisting of electro-optical devices which play ancient phonograph records with laser beams

My title *The Edison Effect* has multiple references. It refers first to the profound and irreversible effect the invention of sound recording has had upon music, the soundscape, upon the time and place of our memory and sense of belonging. It should also call to mind Thomas Alva Edison's illicit claim to the invention of the light bulb, and his general propensity for copying and appropriation as an emblem of the inherently uncertain authorship of all recorded works. Finally, it invokes a metaphorical allusion to the physical phenomenon known as the »Edison Effect« wherein atoms from a glowing filament are deposited on the inner surface of light bulbs causing them to darken. It was this phenomenon of thermionic emission that, when understood, made possible the invention of the »audion« or vacuum tube. This, in turn, led to the development of sound amplification as well as radio, television and the earliest digital computers. The metaphorical image of the darkening of the light is an ancient one, recurring in the I-Ching, in Mazdaism, and in Shakespeare's oxymoronic »Night's candles are burnt out«. Enantiodromic reversal at the atomic level can be used to symbolize opposing primal forces and may serve to mythicize otherwise commonplace occurrences.

Edison's name and face are synonymous with invention, brilliance and technological innovation. As the modern Prometheus, he lured millions toward the light. The light bulb, commonly believed to be his consummate invention, still stands as an iconic exclamation of ideas, innovation — the stroke of genius.[1] The discovery of a potentially fatal flaw inherent in the invention — that the light-producing bulbs would themselves darken, causing them to cast shadows rather than light — was perceived by Edison to be a potential bug, a stain upon his brilliant reputation. To compound the paradox with irony, this is the only bona fide scientific phenomenon which bears the inventor's name. Whereas other nineteenth century colossi, such as Tesla, Ampere or Volta had basic units of measure or even third world nations named after them, Edison, universally resented by the scientific community and deemed by them a charlatan and promoter, was grudgingly awarded only this obscure and obscuring »effect« to immortalize his name.

It is often the case that a new medium's first major flaw or contradiction is destined to become its dominant metaphor. The disembodying upside-downness of Della Porta's camera obscura, the shadows created by light falling on Niepce's photographic emulsion producing a »negative« image, the montage necessitated by the frailty and shortness of early celluloid film — these have become the mechanophors which convey the richness and complexity of our experience. No less with the whole of Edison's oeuvre. Like the lightbulb, the phonograph casts its own unearthly shadows upon listening, upon our memory and our sense of time. It is the false and deceptive quality of the voice which emanates from the phonograph or gramophone, compounded by the mindless soliloquy of the broken record, which lends its root to our word »phony«. The exact repetition of this falsehood ingrains itself in our memories, creating a sequence of recognition, anticipation and fulfillment which is in itself addictive and predictive. Prior to the invention of mechanical recording, references to the now commonplace phenomenon of a tune-running-thru-the-head appear absent from literature.[2]

1 Notwithstanding Felix-the-Cat's ectoplasmic punctuation marks — insights which could become tools of inquiry or aggression.

2 We do not know if Emily Dickinson's image of the »The Brain, within its Groove / Runs evenly — and true —« refers to sonic material, nor if Edison drew on her imagery for his inspiration.

The invention, or rather, the discovery, of sound recording and reproduction by Edison came as a shock to the entire world, the inventor included. Edison's reputation had grown as an inventor of electrical miracles — but the talking machine was a simple mechanical contrivance which could have been built successfully several centuries earlier, in plenty of time to skyrocket Bach and Mozart to international stardom. The technological wheels had long been in spin. Beeswax, a medium with a natural propensity for capturing aromatic and sonic essences, was abundantly available. Spring driven clockwork motors with speed governors had been around since the seventeenth century. The theory that sound consisted of mechanical vibratory disturbances, held since Aristotle's time, had been quantitatively studied by Marin Mersenne, who actually recorded the vibrations of a tuning fork on the surface of a brass bar before 1650.

At the time of the phonograph's gestation, Edison's legendary research team had been working furiously on three diverse electrical contraptions. One (a forerunner of our FAX machines) was a machine for copying and transmitting images. Another was a variety of recording telegraph for embossing Morse code. The third was an electro-mechanical device for amplifying voice received over telephone lines — Edison wanted to call it the »telespeacan« — although it couldn't. All three involved a threaded lead-screw moving a stylus which impinged upon a rotating drum. In retrospect, the synergistic serendipity seems obvious: a copying machine, a machine for storing words, a machine for making sounds... but it was not so at the time.

When Edison announced that he could record and reproduce human speech, he met with incredulity. Eminent authorities, including French scientist Sainte Claire de Ville, upon reading announcements of the talking machine, pronounced it a fraud and a hoax perpetrated by a concealed ventriloquist — totally phony. Either Edison's reputation for chicanery had preceded him, or there existed conceptual barriers which made the feat seem more difficult than it actually was. Perhaps the very notion of compressing the vitality of human utterances, of squeezing the flights-of-fancy of musical invention into the unidimensional coffin of machine reproduction was abhorrent on some primal level. Or perhaps, there persisted the stubborn notion that sounds are inherently transitory and must always be synthesized or intoned-anew,[3] as in the Futurist intonarumori (music boxes with an agenda). The spirit of that doubt is lost forever. Now, as he stood in the shadow of his own reputation, Edison appeared both larger and flatter than life.

Among the cognoscenti, Alexander Graham Bell, Edison's main competitor at the time, was shocked when he heard news of the phonograph — amazed that he had not invented it himself. »It is an astonishing thing to me that I could possibly have let this invention slip through my fingers when I consider how my thoughts had been directed to this subject for so many years«,[4] he confided. But Bell had missed by a mile — his researches had been directed toward devising mechanical models of speaking and of hearing. What Edison had created in the phonograph was a mechanical model not of hearing, but of remembering.

A dream of early phonographers was to read with their eyes the wiggly line inscribed by the needle as a lasting trace upon the wax — allowing the illiterate to write, the uncouth to compose, even the spirits of the dead to speak. Such efforts soon proved futile.[5] The scopic impulse relentlessly afoot in western civilization appears to have been delayed by almost an epoch. If the nineteenth century had invoked sight alone to comprehend the infinity of space (superseding the eighteenth century's insistence that space is known by the sense of touch), a more ancient tactile paradigm persisted in matters of memory, perhaps due to their traditional codings in the form of renaissance spatial-mnemonic systems. Until very recently — the 1980's — the memorative act of audition still consisted of dragging a diamond stylus, fingernail-like, across a vinyl blackboard. As the needle played, it eroded the memory it touched. Ever so slightly, as the needle touched, the sounds present in the room in which it played were minutely engraved and added to the record.

3
Such synthesis implies a prior analysis. Inherent in such a notion (which persists to this day in computer music) is the idea of physical modeling — basically, a proof that the author totally comprehends and thus dominates the system in question.

4
Quoted in Douglas Kahn, *Wireless Imagination*, Cambridge, Mass: MIT Press 1992, p. 86.

5
It was not until the last decades of the twentieth century that the visible traces of speech succumbed to human reading, and then to only one human, Victor Zue.

Edison's earliest efforts were feeble impressions on tinfoil, easily erased by the act of playing them. Indeed, the first recording was so frail it only could reproduce once and then die. Later efforts in wax proved durable enough to be played dozens of times before the effects of the mechanism combined with the sounds in the environment would modify and erase them forever. And still each record was a unique object. The Edison laboratory's earliest cylinders of mass production were created by capturing the sound of an orchestra on twenty or more phonographs — the orchestra's output of a two minute waltz might thus amount to many hundred cylinders per day.[6] By the turn of the century, with the advent of electroplating and gold-molding, many thousands of records could be manufactured, sold, played, enjoyed and worn out before the orchestra would need to reconvene and intone the waltz anew. The escalation of this economic exercise culminates in the digital compact disc — a consumer item whose durability is adamantine and whose relation to the original soundwaves — thus its use-value — is determined wholly by the ruling taste. The laser touches but fleetingly upon the groove, the impact of its photons abrading no material whatsoever. The rupture is complete. The emancipation of memory from touch has been fulfilled. The age of the palimpsest is over.

6
The fact that the several phonographs were spread out in the recording studio has made possible the excavation of primitive stereo imaging by combining two or more cylinders from a single »take«.

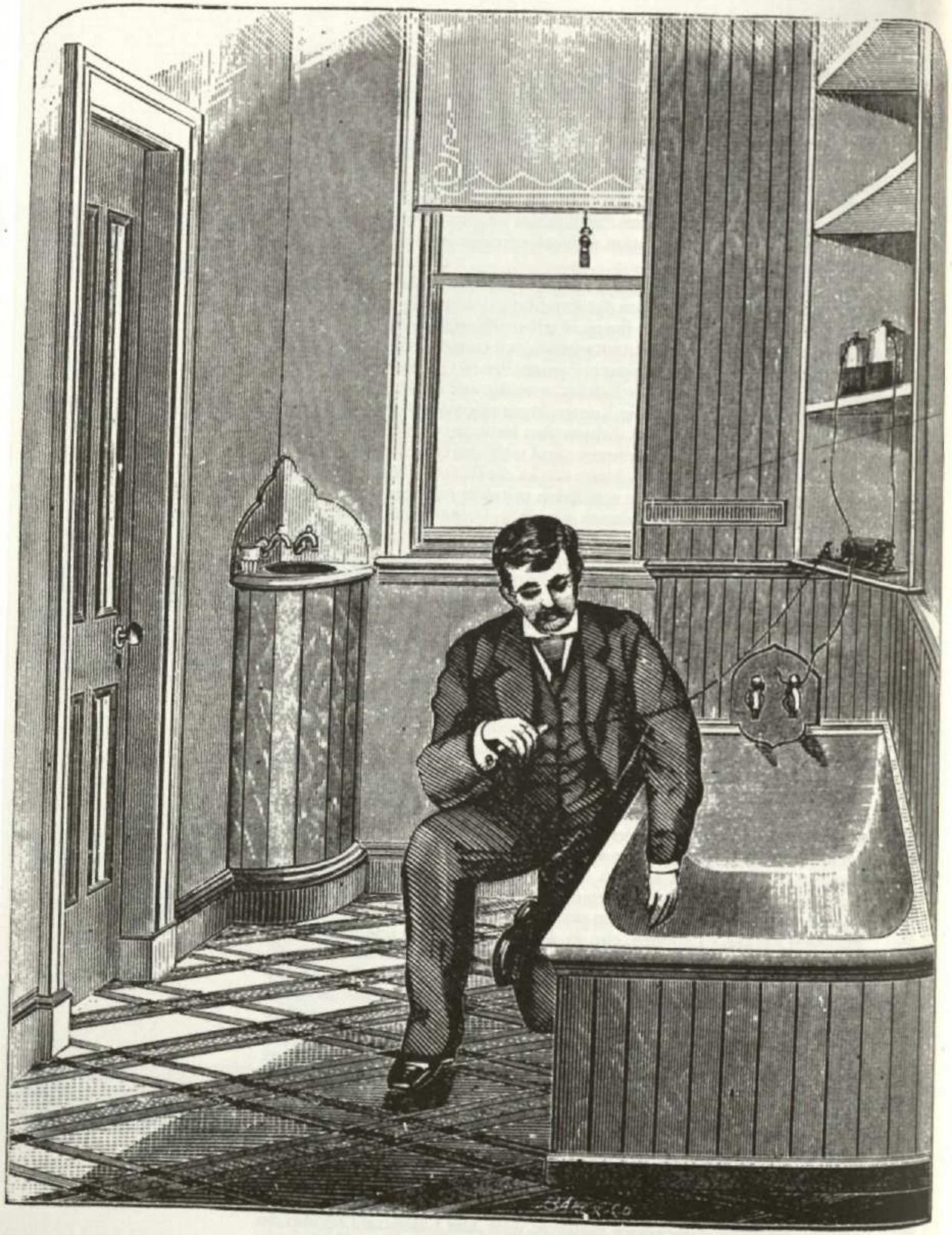
Essay anstelle einer Sonate 1993

Reflexionen über The Edison Effect, eine Serie von Audio-Installationen mit elektro-optischen Geräten, die alte Schallplattenaufnahmen mit Laser abspielen

Mein Titel *The Edison Effect* verweist auf verschiedene Zusammenhänge. Da sind zunächst einmal die weit reichenden und unumkehrbaren Folgen, die die Erfindung der Tonaufnahme für Musik, Umgebungsklang, Zeit und Ort unseres Gedächtnisses sowie für unser Zugehörigkeitsgefühl mit sich brachte. Darüber hinaus soll der Titel an Thomas Edisons ungerechtfertigten Anspruch auf die Erfindung der Glühbirne und seinen Hang zum Plagiat erinnern, was wiederum emblematisch für die generell unklare Autorschaft aller auf Reproduktion beruhenden Werke stehen kann. Und zu guter Letzt ist er eine metaphorische Anspielung auf das physikalische Phänomen, das unter dem Namen Edison-Effekt bekannt ist: die Ablagerung von Glühfadenatomen auf der Innenseite der Glühlampe, wodurch diese allmählich dunkler wird. Dieses Phänomen der thermionischen Entladung ermöglichte schließlich die Erfindung des »Audion« oder der Vakuum-Röhre, und diese wiederum führte später zur Entwicklung der Klangverstärkung, des Radios, des Fernsehens und der ersten digitalen Computer. Die Metapher von der Lichtverfinsterung ist seit altersher bekannt und findet sich schon im I-Ging, im Mazdaismus oder in Shakespeares Oxymoron »die Nacht hat ihre Kerzen ausgebrannt«. Die enantiodromische Umkehrung auf atomarer Ebene eignet sich also gleichermaßen zur Symbolisierung gegensätzlicher Urkräfte wie zur Mythologisierung von ansonsten ganz banalen Erscheinungen.

Edisons Name und Person stehen für Erfindungsgabe, Scharfsinn und technologische Innovation. Wie ein moderner Prometheus lockte er Millionen zum Licht. Die Glühbirne, im Allgemeinen als seine größte Erfindung angesehen, ist immer noch das ikonografische Ausrufungszeichen schlechthin für den genialen Einfall, den Geistesblitz.[1] Die Entdeckung eines womöglich in der Erfindung enthaltenen verhängnisvollen Nachteils — dass der Lichtspender selbst sich verdunkelt und dann Schatten statt Licht wirft — empfand

1
Einsichten, die ungeachtet Felix-the-Cats ektoplasmatischer Zeichensetzung sowohl der Erkenntnis als auch der Gewalt dienen können.



The musical bathtub

Gray Matter

1995

Our electronic media may be regarded, in large part, as the outgrowths of nineteenth century laboratory apparatuses designed to isolate and investigate the functioning of human sensory organs. Viewed thus, they fracture the wholeness of sensation in an effort to preserve, replay or transmit over distance the specters of our sensory experiences. But Victorian science, obsessed as it was with isolation, analysis and reduction, had a goofy side too, a far reaching interest in the discovery and creation of chimeras — impossible combinations of two distinct beings, griffins, gargoyles, etc — both natural and artificial. In particular, the age of the inventor was also the age of the tinkerer, the combiner, the patenter of hybrid forms. No natural zoology could have engendered derby-hat cameras, bicycle hammocks and swearing tops. Perhaps every attempt to reconstitute the sensory wholeness allegedly lost by recording and transmitting media may be regarded as a chimera, the foremost survivor of which has been the sound-cinema with its uneasy pact between sight and sound serving to perpetuate a myth of synesthesia. But a host of other teratogeny were, and are, being spawned, tried, rejected and occasionally marketed in a ceaseless attempt to achieve multimedia.

There is a popularly promoted belief that technology drives culture forward, and that our changing relationships to one another, material and informational, are the result of advances made by science and are manifested in the development of new materials, processes and tools. Gilles Deleuze points out the flaw in this thinking: »... technology makes the mistake of considering tools in isolation: tools exist only in relation to the interminglings they make possible or that make them possible.« A glance at the incredible variety of possible technologies that have fallen along the wayside serves to support this view.

The present work lurches forward to examine one such forgotten technology — one that failed to acknowledge the rupture between hearing and feeling, that is touching. There is no clear cognitive border between feeling and hearing. Most certainly indistinguishable in the womb, these are the two sensations with which we have the longest continuous experience. The invention of sound recording, initially incapable of reproducing low and palpable frequencies, exacerbated a rupture between touching and hearing that had been building through several centuries of notated music. By the last decades of the 19th century, audible and feelable vibration had become so dissociated that inventors were having a difficult time understanding the relations between waves, vibrations and electrical undulations. A great many chimeric inventions resulted, among which is the telephone, commonly regarded as the work of one man.

Alexander Graham Bell had won his renown as a teacher of the deaf — patients who conveniently manifested the aforementioned rupture by being able to feel but not hear. Bell's teaching methods relied upon lip reading only in part — the greater part of his expertise lay in conveying missed auditory information to his pupils by touching their hands in a defined grammar of strokes. This special knowledge gave him a distinct advantage over the many other inventors racing to formulate and patent what was to be the invention of the century. When the great race was won, Bell was the victor, filing his caveat on February 14, 1876. As bad luck would have it, five hours later that same day Elisha Gray staggered breathless into the patent office with his application for the telephone.

There is no room here for an examination of the trajectories Bell and Gray had followed to arrive at the similar apparatus in 1876. Suffice it to say they were different and in their diversity had given birth to many technological curiosities and chimeras, not least of which was Elisha Gray's »musical bath-

tub« of 1874. In *Mechanization Takes Command* Sigfried Giedion has pointed out the Victorian era's preoccupation with the mechanization of bodily functions, from weaving and skinning to cooking and bathing. Elisha Gray's fusion of bathing technology with audio technology and playing music is one more chimera ornamenting the den of 19th century monstrosities.
»In late January or early February of 1874 [Gray] heard the refrain of the rheotome issuing from his bathroom, where he found his young nephew »taking shocks« to amuse the smaller children. With a vibrating rheotome in the circuit of a primary induction coil, the boy connected one end of the secondary coil to the zinc lining of the bathtub and held the other end in his hand. When the boy's free hand glided along the bathtub lining, it produced a whining sound in tune with the rheotome. Gray tried the effect and found that quick, hard rubbing made the noise even louder than that of the rheotome itself. When he varied the pitch of the rheotome, the noise followed suit.«[1]
By some obscure and little studied phenomenon, a vibrating electrical field seems to modulate the coefficient of friction of our skin, so that when we bow across an electrified surface with our fingers, we excite mechanical vibrations. These mechanical vibrations, suitably coupled, give rise to audible sounds. I discovered this phenomenon, as Gray did, quite accidentally in 1976, and I'm sure other people run across it every day. In a sense, Gray's discovery was likelier than ours, being as he was much closer to the era of Benjamin Franklin and Mary Shelley, when electricity, life force and neural sensation were believed to consist of one in the same fluid.
As we stroke the wires of *Gray Matter,* we both feel as texture and hear as sound the faint electrical stirrings within the wire — melodies, scales, creakings and glissandi inhabit a world in which touch and hearing are for a moment unified. This phenomenon may someday find a fit to the structure of our relations — perhaps as electrically definable surface textures, audio communication in a vacuum, or other applications. But for now it languishes in the backwater of the culturally inappropriate, insignificant and obscure.
Several pieces in this collection are based on Gray's later version of an electrical sound maker. Using a more familiar electromagnetic design, it was a direct forerunner of the familiar loudspeaker and became part of Gray's telephonic apparatus of 1876. Of interest to me is that it retains the connection to bathing apparatus in the form of a washbasin. Wisdom aside, one wonders, had Gray beat Bell to the patent office, if our telephones might not »ring«, and if we might not enter the washcloset to speak afar, stroking small tin tubs as we listen.

1
Robert V. Bruce, Bell: *Alexander Graham Bell and the Conquest of Solitude*, Ithaca, NY: Cornell University Press 1973, p. 114.

Gray Matter

1995

Unsere heutigen elektronischen Medien lassen sich weitgehend als Abkömmlinge von Laborapparaturen aus dem 19. Jahrhundert betrachten, die zur Isolierung und Untersuchung der Funktionsweise menschlicher Sinnesorgane entwickelt wurden. Insofern zergliedern sie mit dem Versuch, Phantombilder der Sinneseindrücke festzuhalten, wiederzugeben und zu übertragen, das Ganze des Wahrnehmungsprozesses. Doch die viktorianische Wissenschaft hatte bei all ihrer Isolierungs-, Zergliederungs- und Reduktionswut auch eine wunderliche Seite: ein weit verbreitetes Interesse an der Entdeckung und Erschaffung natürlicher wie künstlicher Chimären — unmöglichen Verbindungen zwischen zwei unterschiedlichen Wesen wie etwa Greifen oder groteske Wasserspeier. Das Zeitalter der Erfinder war auch ein Zeitalter der Bastelei, der Kombinatorik, der Patente auf hybride Formen. Dinge wie Melonenkameras, Fahrradhängematten und Schimpfkreisel hätten durch keine Naturgeschichte hervorgebracht werden können. Vielleicht ist jeder Versuch, die durch Aufnahme- und Übertragungsmedien vermeintlich verloren gegangene Ganzheit der Sinneswahrnehmung wiederherzustellen, als eine Chimäre zu betrachten, wobei zu den wichtigsten Überlebenden dieser Gattung wohl der Tonfilm gehört, der mit seinem problematischen Pakt zwischen Bild und Ton den Mythos der Synästhesie am Leben erhält. Allerdings wurden und werden immer noch jede Menge anderer Monstrositäten erzeugt, erprobt, verworfen und — in dem unablässigen Versuch, Multimedialität herzustellen — manchmal auch auf den Markt gebracht.

Nach einem weit verbreiteten Glauben ist die Technologie die Triebkraft der Kultur und sind unsere sich verändernden — materiellen wie informationellen — Beziehungen das Ergebnis wissenschaftlichen Fortschritts, das sich in der Entwicklung neuer Materialien, Verfahren und Werkzeuge niederschlägt. Gilles Deleuze verweist auf den Fehler dieses Denkens, wenn er schreibt: »[D]ie Technologie hat unrecht, wenn sie Werkzeuge an sich betrachtet: diese existieren nur im Hinblick auf Mischungen, die sie möglich machen oder die durch sie möglich sind.« Zur Stützung dieser Ansicht genügt ein bloßer Blick auf die Unmenge möglicher Techniken, die im Lauf der Zeit auf der Strecke geblieben sind.
Die vorliegende Arbeit macht sich an die Untersuchung einer solch vergessenen Technik — einer, die sich weigerte, die Trennung zwischen Hör- und Tastsinn zu akzeptieren. Zwischen Hören und Fühlen gibt es keine klare kognitive Grenze. Die beiden im Mutterleib noch ununterscheidbaren Sinnesempfindungen sind diejenigen, mit denen wir die längste durchgehende Erfahrung haben. Die Erfindung der Tonaufnahme, die anfangs keine tiefen, fühlbaren Frequenzen wiederzugeben vermochte, verstärkte noch den Bruch zwischen Tast- und Hörsinn, der sich über mehrere Jahrhunderte notierter Musik herausgebildet hatte. Bis in die letzten Jahrzehnte des 19. Jahrhunderts hatten sich hör- und fühlbare Schwingungen dermaßen auseinander entwickelt, dass Erfinder Probleme hatten, das Verhältnis zwischen Wasserwellen, mechanischen Vibrationen und elektrischen Schwingungen zu verstehen. So kam es zu einer Fülle chimärischer Erfindungen, wozu auch das zumeist als das Werk eines Einzelnen gesehene Telefon zählt.
Alexander Graham Bell hatte sich seine Reputation durch die Arbeit mit Gehörlosen erworben — Menschen also, in deren Behinderung sich der vorhin erwähnte Bruch zwischen Hören und Fühlen praktisch manifestierte. Bells Lehrmethode beruhte nur zum Teil auf Lippenlesen; zum größeren Teil stützte sie sich darauf, die fehlende akustische Information dadurch zu übertragen, dass er die Hände seiner Schüler nach einer bestimmten Grammatik berührte. Dieses Spezialwissen gab ihm einen klaren Vorteil gegenüber den vielen anderen Mitbewerbern im Wettrennen um die Ausformulierung und Patentierung dessen, was sich als Erfindung des Jahrhunderts erweisen sollte. Bell beendete das Rennen als Sieger, als er am 14. Februar 1876 sein Patent anmeldete. Ein unglücklicher Zufall wollte es, dass Elisha Gray nur fünf Stunden nach ihm atemlos ins Patentamt stürzte, um den eigenen Antrag für das Telefonpatent einzureichen.
Der Platz reicht hier nicht aus, um die verschiedenen Wege zu beschreiben, über die Bell und Gray 1876 zu einem ähnlichen Apparat gelangten. Es muss die Feststellung genügen, dass sie sehr verschieden waren und in ihrer Verschiedenheit zahllose Kuriositäten und Chimären hervorgebracht hatten, darunter nicht zuletzt auch Elisha Grays »musikalische Badewanne« von 1874. Sigfried Giedion weist in *Die Herrschaft der Mechanisierung* darauf hin, wie sehr sich das viktorianische Zeitalter mit der Mechanisierung körperlicher Tätigkeiten — vom Weben über das Häuten bis zum Kochen und Baden — beschäftigte. Elisha Grays Verbindung von Bade- mit Audiotechnologie und Musikwiedergabe ist eine weitere solche Chimäre im Kuriositätenkabinett des 19. Jahrhunderts.

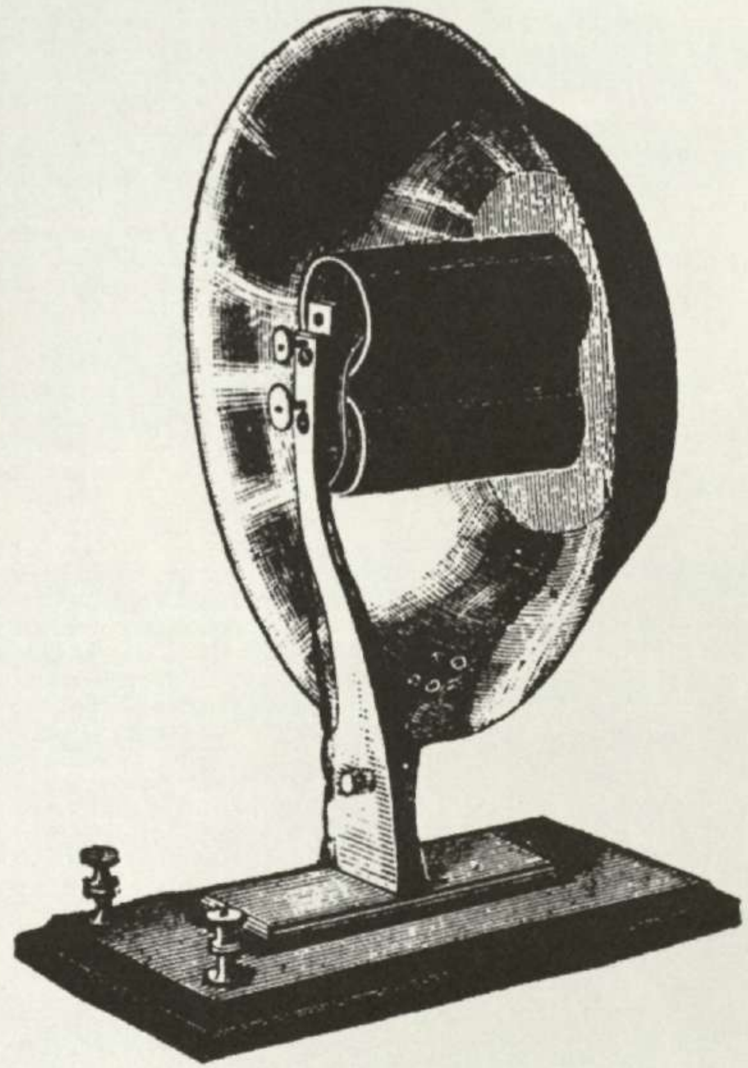
»Ende Januar oder Anfang Februar 1874 hörte [Gray] wiederholt das Brummen des Wagnerschen Hammers aus dem Badezimmer dringen, wo sein junger Neffe die kleineren Kinder damit unterhielt, dass er sich ›elektrische Schläge‹ holte. Während der Wagnersche Hammer im Stromkreis der primären Induktionsspule vibrierte, verband der Junge das eine Ende der Sekundärspule mit der Zinkauskleidung der Badewanne und hielt das andere in der Hand. Strich er mit der freien Hand über die Innenseite der Badewanne, gab diese einen auf den Wagnerschen Hammer abgestimmten Heulton von sich. Gray versuchte es selbst und entdeckte, dass dieser bei raschem Reiben das Brummen des Wagnerschen Hammers sogar übertönte. Verstellte er letzteren in der Tonhöhe, veränderte sich auch die der Wanne.«[1]

Durch ein mysteriöses, kaum erforschtes Phänomen, verändert sich der Reibungskoeffizient unserer Haut in einem schwingenden elektrischen Feld anscheinend so, dass wir mechanische Vibrationen auslösen, wenn wir mit den Fingern über eine Strom führende Oberfläche streichen. Bei entsprechender Kopplung lösen diese mechanischen Vibrationen hörbare Töne aus. Ich entdeckte dieses Phänomen — ebenso zufällig wie Gray — im Jahr 1976 und vermutlich kommen andere alle Tage damit in Berührung. In gewisser Weise war aber die Entdeckungswahrscheinlichkeit für Gray viel größer, weil er noch näher am Zeitalter von Benjamin Franklin und Mary Shelley lebte, in dem man Elektrizität, Lebensenergie und Nervenerregung auf ein- und dieselbe Flüssigkeit zurückführte.

Streicht man über die Saiten von *Gray Matter*, sind die schwachen elektrischen Ströme in ihnen gleichermaßen taktil wie akustisch wahrnehmbar — Melodien, Tonleitern, Knarrgeräusche und Glissandi bevölkern eine Welt, in der Tast- und Hörsinn einen Momentlang eins sind. Vielleicht findet dieses Phänomen ja irgendwann einmal einen Platz im Gefüge unserer sozialen Beziehungen — als elektrisch definierbare Oberflächenstruktur, als akustisches Kommunikationsmittel im Vakuum oder dergleichen —, doch im Augenblick dümpelt es in der Rumpelkammer des kulturell Unangepassten, Bedeutungslosen und Abstrusen vor sich hin.

Mehrere Arbeiten dieser Gruppe beruhen auf einem späteren elektrischen Klangerzeuger Grays. Dieser, ein uns heute besser vertrautes elektromagnetisches Design, war ein direkter Vorläufer des uns bekannten Lautsprechers und Teil von Grays Telefonapparat von 1876. Das Interessante daran ist für mich, dass er mit seiner Waschschüsselform eine Verbindung zu Badeapparaturen aufweist. Von der Sinnhaftigkeit einmal abgesehen, fragt man sich dann schon, ob unsere Telefone heute möglicherweise nicht »klingelten« und wir zum Fernsprechen ins Badezimmer gingen, um über kleine Zinnwannen zu streichen, wenn es Gray vor Bell zum Patentamt geschafft hätte.

1 Robert V. Bruce, Bell: *Alexander Graham Bell and the Conquest of Solitude*, Ithaca, NY: Cornell University Press 1973, S. 114.



The washbasin receiver

Images are from / Bilder aus: George Bartlett Prescott, *The speaking telephone, talking phonograph, and other novelties*. New York: D. Appleton 1878



The Lecture of Comrade Stalin at the Extraordinary 8th Plenary Congress about the Draft Concept of the Constitution of the Soviet Union on November 25, 1936

1998

During a visit to Tallinn in 1995 I found a set of twenty 10-inch 78 rpm records of a speech by Joseph Stalin in a junk store. Together with Paul Panhuysen, the set was purchased and divided between us with the agreement that we would provide each other with DAT tapes of the disks in our possession. In addition we agreed that we would create independent works based on the material and at some point in the future, make an exhibition or project together of our resulting works. I have created a number of pieces from the material including visual objects, kinetic sculptures and sound compositions. All these works carry the identical title, *The Lecture of Comrade Stalin at the Extraordinary 8th Plenary Congress about the Draft Concept of the Constitution of the Soviet Union on November 25, 1936*, so there is some confusion about the exact identity, as well as the medium of, my work — perhaps my own paranoid response to a potentially monstrous presence lurking in these grooves.

Stalin was rarely recorded and even less frequently were his recorded words, even his greatest wartime speeches, released as audio documents. While myriad printed volumes of his writings survive, translated into more languages than even *The Watchtower*, Stalin's voice seems to be hiding somewhere behind rather than within the bright-red bound volumes. With good reason, conjecture historians: his thick Georgian drawl, the kind of thing that would be an outright asset to an American politician, made him feel like a foreigner in the Kremlin[1]. As a tyrannosaurus among dictators, flourishing in the age of the great dictators — great vocal personalities like Hitler, Mussolini, Churchill and Roosevelt who performed like brilliant stars on stage, on radio, and in film — Stalin is something of a vocal mystery-man. No one seems to remember the grain of his voice. When we listen to the arid forty[2] sides of his 1936 release the reason becomes apparent: Stalin's voice is quiet and mumbling. Short utterances are like uninhabited islands somehow lost in a sea of embarrassing pauses, now filled in by the oceanic roar of cheap Soviet bakelite.

The occasion of this speech was of particular significance, given on the eve of the ratification of the Soviet Constitution — in his day referred to lovingly as the »Stalin Constitution.« The speech of November 25, 1936, amid the show trials and purges, represented something of an imperial coronation standing, as it does, midway between Kirov's assassination and Bukharin's last plea. Within this speech Stalin declared that the Soviet Union had now passed from the state of socialism into communism. If this news reached Highgate Cemetery in London, it is certain that much in-grave rotation resulted. This hardly Marxian pronouncement was, in effect, a call to total agrarian collectivization and a rationalization for the wholesale liquidation of the kulak class and persecution of the intelligensia. This speech was broadcast throughout the Soviet Union and heard by everyone. It announced Stalin's brutal hegemony after years of bloody purges, his triumph as the defining force of Soviet communism. The full recording was released as a boxed set so that frequent re-broadcast and listening could indoctrinate the masses in the new cult of personality that was to endure until Stalin's death in 1953.

The Lecture of Comrade Stalin at the Extraordinary 8th Plenary Congress about the Draft Concept of the Constitution of the Soviet Union on November 25, 1936 uses a variety of sound materials alongside and in combination with

1 »Death to the Russians!« was, claimed Stalin's Politburo crony Anastas Mikoyan, the brooding Georgian's customary toast during the late Forties. Cf. Ian MacDonald »Witnesses for the Defence: Testimonies concerning Shostakovich's attitudes to the Soviet regime«, March 1998, *http://www.siue.edu/~aho/musov/witness/wit.html*

2 At 3 minutes a side, 40 sides is still a whopping 2 hours long.

Stalin's own voice. Other voices from the spirit realm herald the openings and closing of doors in the various sections of the work. Birds and birdlike whistles, deriving both from the Kaluli spirit world and from formant-glides extracted from Stalin's own voice, serve to convey his presence at a safer, more abstracted distance. Musical ghosts also abound both in the form of thematic quotations and as »morphed« samples. These are combined with and replicated within Stalin's voice by a variety of digital analysis/resynthesis techniques. In most cases karmically if not historically wed to Stalin's voice, they derive from musical sources associated with the dictator.

If Stalin's voice, like Lina Lamont's, was a weak point in his stardom, voice was also central to Stalin's inner identity. As a young seminarian in the Orthodox church, Joseph Djugashvili was known for his fine singing voice. On the closer listening that computer analysis affords, melodic movements are heard within the short mumbled phrases that are perhaps ghosts of the Georgian liturgical music he once sang. Echoes of the earnest young seminarian, singing with avowed devotion, are heard in the earlier parts of the work.

Stalin's renown as a music critic stems from his review, in *Pravda* under an assumed name, of Dmitri Shostakovich's opera, *Lady Macbeth of the Mtsensk District* in 1936. The opera's plot concerns a murder spree by a bored bourgeois housewife, Ekaterina, and her lover Sergei. Anecdote has it that Stalin's abrupt departure from the opera mid-performance was due to his moral indignation at certain »erotic« trombone glissandi that accompany Sergei's penile detumescence. Other readings of this decisive departure are possible, though. The victims of the lover's crimes are small landowners and the blood on Ekaterina's hands smells a lot like that on Stalin's after the mass exterminations in the Ukraine in 1932. The *Pravda* article nearly cost Shostakovich his life, and made him especially vulnerable to official criticism for the rest of his career. Strains from his musical penance, the 5th Symphony, composed immediately after his fall from grace, also find their way into these grooves. Elvis too, the inheritor of the WWII dictatorial-oratory-become-ballad, involves himself insidiously throughout the work. As a Hollywood version of Sergei, he mingles climactically with Ekaterina's ecstasies and stands in as Stalin's radiophonic double.

Of course we might wonder about Stalin's private tastes in music. An intriguing mention is made by Yugoslav envoy Milovan Djilas in *Conversations with Stalin*. He describes a very tense late night meeting that took place at Stalin's dacha on the eve of Tito's split with the USSR early in 1948.

> ...before we began to disperse, Stalin turned on a huge automatic record player. He even tried to dance, in the style of his homeland. One could see that he was not without a sense of rhythm...
>
> Then Stalin turned on a record on which the coloratura warbling of a singer was accompanied by the yowling and barking of dogs. He laughed with an exaggerated, immoderate mirth, but on detecting incomprehension and displeasure on my face, he explained, almost as though to excuse himself, »Well, still it's clever, devilishly clever.«[3]

3 Milovan Djilas, *Conversations with Stalin*, New York: Harcourt Brace & World, 1962.

An automatic record player? This was perhaps the large RCA console given to Stalin by Harry Truman, but the record described would seem totally contrary to the ruling Soviet musical tastes. Indeed, could such a record have been produced and disseminated in the late 1940s in the USSR? Perhaps, like the phonograph, it was an import. And the import that leaps to mind on reading Djilas' description would be »Il Barkio« recorded by Spike Jones and His City Slickers in 1947. A soprano, accompanied by piano, starts singing a credible version of Arditi's »Il Bacio,« only to be first interrupted by, and then willingly accompanied by, the City Slickers howling and barking like a pack of dogs. This notion of Stalin-the-Spike-Jones-fan is unprovable but tantalizing. No doubt, he'd heard Donald Duck sing Spike's greatest hit, »In Der Fuehrer's Face.«

The first presentation of this work was in 1996 as part of a week of performances with Merce Cunningham Dance Company's »Events« at the Joyce Theater in New York. In advance of the series I had described the »morphs«

between samples of Stalin and Lady MacMtsenk to the *Village Voice*'s dance critic. On the afternoon before the second »Events« performance, the company director approached me, saying »we have a problem...« It had occurred to me that the soviet-realist strains that survived the onslaught of Lemur and SoundHack might sound a tad too retro for Merce, but this wasn't the case. Rather, Shostakovich's ghost, in the form of a New York lawyer who looks out for his estate, wanted royalties paid for the use of the samples. For a moment I felt relieved that it wasn't Stalin's ghost, with a gun to the back of my head. Later it occurred to me that maybe Stalin, tyrant of the century, murderer of millions, doesn't have a lawyer looking out for his interests — or does he? For that matter, who collects the royalties for *Mein Kampf*?

The six minute and sixty-six second piece presented here[4] is a combination of various fragments from an hour long work of the same title. The speech and other sonic materials were analyzed, combined and resynthesized by a variety of digital audio tools including SoundHack, Lemur and MSP.

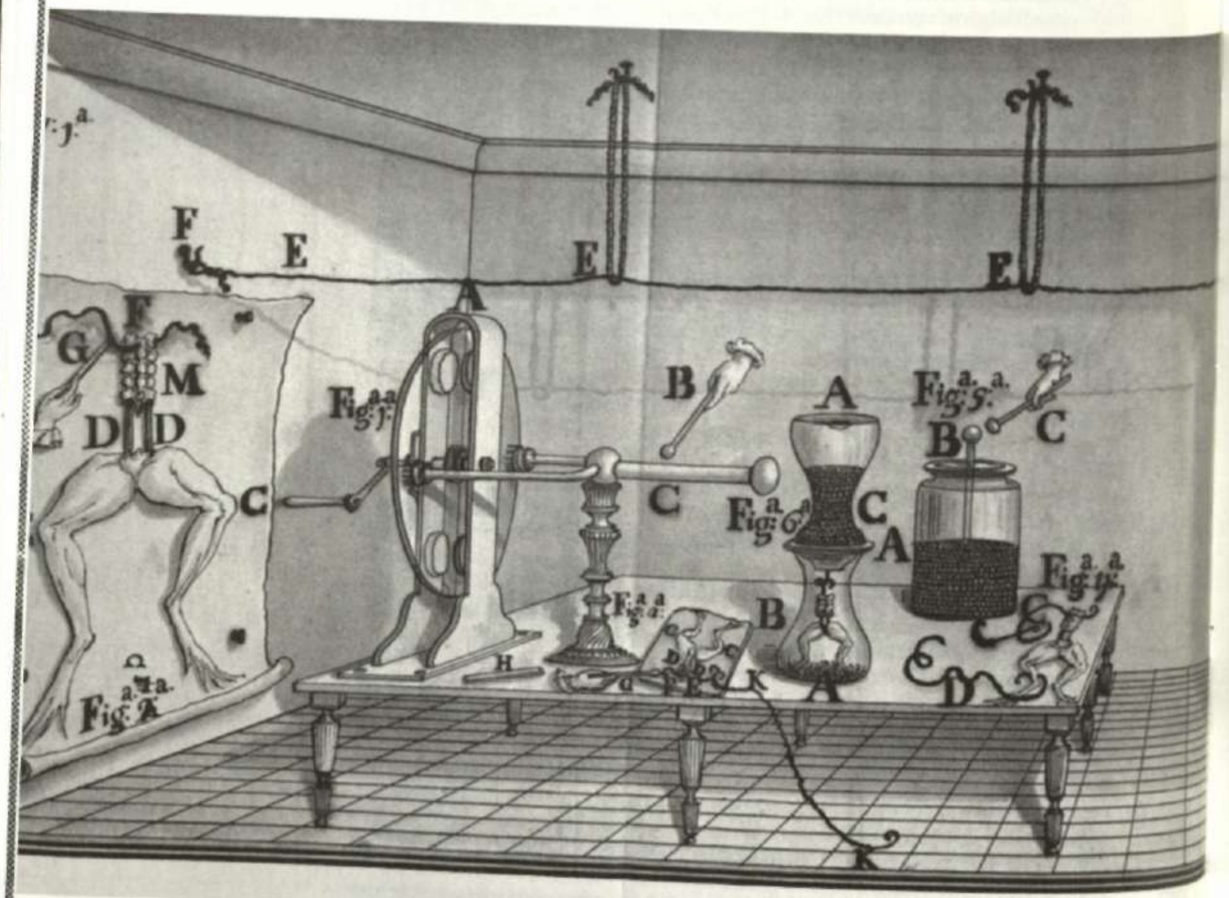
4 This text was originally written to accompany of an excerpt of the piece in *Leonardo Music Journal* →266

The Lecture of Comrade Stalin at the Extraordinary 8th Plenary Congress about the Draft Concept of the Constitution of the Soviet Union on November 25, 1936 — 1998

Bei einem Aufenthalt in Tallinn im Jahr 1995 entdeckte ich in einem Trödelladen einen Satz von zwanzig 10-Inch-Schellackplatten mit einer Rede Joseph Stalins. Ich erwarb den Satz gemeinsam mit Paul Panhuysen und wir kamen überein, ihn untereinander aufzuteilen und einander DAT-Bänder von den in unserem Besitz befindlichen Platten zukommen zu lassen. Außerdem beschlossen wir, unabhängig voneinander auf dem Material basierende Arbeiten zu produzieren und mit den Ergebnissen irgendwann einmal eine gemeinsame Ausstellung oder ein Projekt zu bestreiten. Ich habe das Material in einer Reihe unterschiedlicher Werke — Bildobjekten, kinetischen Skulpturen, Klangkompositionen usw. — verarbeitet, die alle denselben Titel tragen: *The Lecture of Comrade Stalin at the Extraordinary 8th Plenary Congress about the Draft Concept of the Constitution of the Soviet Union on November 25, 1936* (Die Rede des Genossen Stalin auf dem Achten außerordentlichen Sowjetkongress über den Entwurf einer neuen sowjetischen Verfassung am 25. November 1936). Es besteht also eine gewisse Unklarheit in Bezug auf die genaue Identität und das Medium meiner Arbeit — was möglicherweise meine eigene paranoide Reaktion auf die potentiell monströse Präsenz in den Rillen dieser Schallplatten ist.

Stalin ist selten aufgenommen worden, und noch seltener wurden seine aufgenommenen Worte, selbst seine größten Kriegsreden, in Form von Tondokumenten veröffentlicht. Während Stalins Schriften, die in mehr Sprachen übersetzt wurden als *Der Wachturm*, in unzähligen Exemplaren überlebt haben, scheint sich seine Stimme eher irgendwo hinter den knallrot gebundenen Bänden zu verbergen. Mit gutem Grund, wie Historiker vermuten: sein breiter georgischer Akzent, der für einen amerikanischen Politiker ein ausgesprochener Pluspunkt wäre, gab ihm im Kreml das Gefühl ein Fremder zu sein.[1] Als Tyrannosaurus unter den Führerfiguren im Zeitalter der großen Diktatoren — darunter stimmmächtige Persönlichkeiten wie Hitler, Mussolini, Churchill und Roosevelt, die sich Bühne, Funk und Film wie echte Stars

1 »Tod den Russen!« war laut Anastas Mikojan, Stalins Intimus im Politbüro, der übliche Trinkspruch des finsteren Georgiers in den späten Vierzigern. Vgl. Ian MacDonald »Witnesses for the Defence: Testimonies concerning Shostakovich's attitudes to the Soviet regime«, March 1998, *http://www.siue.edu/~aholmes/witnesswit.html*



The Messenger

1998

They were given the choice of becoming kings or kings' messengers. Like children, they all wanted to be messengers. Therefore there are nothing but messengers; they race through the world and, because there are no kings, call out their messages, which have become meaningless in the meantime, to each other. They would gladly quit this miserable existence, but don't dare to because of their oath of office. — Kafka[1]

1 Franz Kafka quoted in Friedrich Kittler, *Discourse Networks 1800|1900*, Stanford: Stanford University Press, 1990

The Messenger is an internet-driven installation based on early proposals for the electrical telegraph, in particular those made by the Catalan scientist Francesc Salvà. As in many of my works I examine the metaphors encoded within technology, especially lost or orphaned technologies and try to trace their origins, speculating on the way that mechanisms are the repositories of larger unspoken conceptions and dreams. In *The Messenger* I take the telegraph as a point of departure from which to examine the relationship between electricity and democracy, and how electrical telecommunication technologies have participated in our solidarity and in our isolation, in our equality and our oppression, in the richness of our experience and the uncertainty of our lives.

In *The Messenger* email messages sent from around the world are received by a computer in Galerie Metronom in Barcelona and spelled out, one letter at a time over three fanciful telegraph receivers. The central receiver, a circular array of talking chamber-pots, speaks out the letters in twenty six different voices. Men, women, schoolchildren and aged pensioners are jarred into vocalization when their individual letter is activated. The watery resonance of the metal bowls creates a unique reverb for each voice, disconnecting it from the other voices and from the acoustic space of the gallery. Along the left alcove of the gallery is a chorus line of 26 little dancing skeletons. Each wears a tiny poncho emblazoned with a letter of the alphabet. When each letter of a message is activated, the skeleton jumps, producing a *danse macabre* as the email messages roll off the internet. In the right alcove the third telegraphic receiver is a line of 26 antique glass jars, each filled with an electrolyte and holding a pair of metal electrodes, one of them shaped like a letter of the alphabet. The electrical currents cause the electrodes to change from shiny metallic to black alternately and to produce hydrogen bubbles. Nowhere does the system possess any memory or understanding of the messages displayed. Unless the signals are observed, written down and interpreted, the installation is the final meaningless terminus for messages that have traveled around the world and died. Related images that come to mind are Babel, the tree falling in the silent forest, the dying cry of the last surviving human. That the phenomenon of the lost or meaningless message has become so frequent an experience in our daily lives is due in no small part to our increasing reliance on electricity as our dominant medium of communication.

Electricity, though observed since ancient times, only became a subject of intense interest in certain enlightened circles during the first half of the 18th century. That the early experimentalists were men of privilege and education is revealed by the materials they used to generate static electricity: fur, amber and sealing wax. That they lived in cold climates, too, was a requisite for the regular observation of the static electricity, for only in cold dry environments can the charge built up by friction accumulate without dissipation by

atmospheric moisture. The invention of the Leyden jar, a primitive capacitor, opened up the possibility of accumulating much larger quantities of the electric fluid. Not coincidentally, many of the same individuals who held this keen interest in electricity had economic interests that led them to tinker with social reform as well. Benjamin Franklin comes to mind as a prime exemplar, but others abounded. The story of the electric telegraph is bound up with the story of democracy. Their myths, to this day, prove to be inextricably intertwined.

Democracy and Electricity the two white knights of the modern age, sallied forth on their adventures on some unknown date in the middle of the eighteenth century. In the case of Democracy, Rousseau's *Social Contract* of 1763 provided a sighting of modern democracy in full regalia. Its favored sidekick's first recorded appearance in the role of a messenger is usually dated to 1753, on the other side of the channel, when a letter from a mysterious C.M. appeared in *Scot's Magazine* proposing a system of rapid signaling across distances using static electricity. This system consisted of 26 wires, one for each letter of the alphabet, to convey electricity from a Leyden jar at the transmitting end, to 26 pith-ball electroscopes at the receiving end. A charge of static electricity, traveling at the speed of light along the wire, would impart a positive charge to two light balls of pith suspended closely together on threads. The like charge would cause the two balls to repel. The message, spelled out one letter at a time, could be reconstructed on the reception side by assiduously observing all 26 sets of pith-balls for this deflection and noting the sequence of corresponding letters.

In the ensuing decades, waves of exported and homebrewed enlightenment rolled first across Europe, and then around the world. As we follow our knights-errant through their exploits, we read with relish of the brave encounters they make with both the residuum of the old patriarchy and with the new forms of oppression that Juliet MacCannell has termed »the regime of the brother«.[2] In electrical demonstrations during the *ancien regime* little distinction was made among the message being transmitted, the path of conduction and the recipient. »On one occassion in a demonstration before the king organized by the Abbé Nollet, 180 guards were said to have been made to jump simultaneously; on another, an entire community of Carthusian monks at Paris, linked together by iron wires, were reported to have made the distance travelled by the shock over 5000 feet (1.5 km).«[3] The Czar of Russia, ever interested in news from afar, held great interest in the newly discovered electrical fluid and replicated the French experiments with Cossacks. When news of the electrical telegraph spread to his empire, however, he immediately suppressed it, lest his enemies employ it to foment a conspiracy reaching from Petersburg to Siberia.

The idea of the electrical telegraph tickled many a great mind on its way to realization. Among them was the Catalan scientist Don Francesc Salvà i Campillo. Though something of a sideline for this polymath, his proposals were significant in a number of ways. They are of particular interest because, spanning as they do from the era of the revolution to the defeat of Napoleon, they reflect, in the spirit of their mechanisms, the transitions of social franchise during this period. Salvà's first proposal is similar to the one described in *Scot's Magazine*. It uses a separate wire for each letter of the alphabet, a Leyden jar to transmit a spark across these wires, but peculiarly, instead of the pith ball electroscopes and indicators, Salvà specifies a number of people, one for each wire. Upon receiving a sensible shock, each of these people, presumably servants, was to call out the name of the letter of the alphabet to which he corresponded. A twenty seventh person, presumably literate, was to write down the message so shockingly spelled out. This is probably the system that Salvà operated between Madrid and Aranjuez in 1798.[4] Whether Salvà's abandonment of pith-ball electroscopes in favor of human receivers was due to problems with electrical dissipation in the moister climate of Barcelona, a cheaper labor pool, or the relative ease of transcription of 26 vocal sources into a coherent message are questions that only further researches into his

2
Juliet Flower MacCannell, *The Regime of the Brother*, London: Routledge, 1991.

3
Margaret Rowbottom and Charles Susskind, *Electricity and Medicine: History of Their Interaction*, San Francisco: San Francisco Press, 1984.



Don Francesc Salvà i Campillo

4
C. MacKechnie Jarvis, »The Origin and Development of the Electric Telegraph«, in: *The Electric Telegraph: An Historical Anthology*, ed. G. Shiers, New York: Arno Press, 1977.



Fig. 341. — Animal tué par la décharge d'une batterie.

work might reveal. Nonetheless, the scene of a hall filled with the sighs, whispers and moans of humanity being shocked into literacy seems an appropriate and emblematic image for the events of 1789.

Other features of the early proposals for the telegraph are of interest here. That the systems, both C.M.'s and Salvà's, were not necessarily conceived of as bi-directional indicates a historically different ideal of communication than we would judge essential. It is interesting to note that the single example offered in C.M.'s text spells the alphabetic sequence S-I-R, reinforcing the impression that the proposal was a product of a member of the aristocracy. Salvà's prescient proposals for a submarine telegraph, too late to save Spain's rapidly crumbling overseas empire, were intended as one-way communication between Spain and the American colonies. Because there was no code or enciphering, a message received on foreign shores would invariably be spoken in foreign accents, danced by new world toads, decompose foreign waters. Thus the imaginary colonial telegraph office portrayed in *The Messenger* uses a variety of distinctly Mexican sounds and images to display the messages sent from afar and Mexican imagery derived from the »Day of the Dead« iconography. In this imaginary colonial telegraph reception hall, messages are received from inaccessible capitals, commands that have lost their meanings. By careful observation and transcription of the sounds and movements we can make out some words and phrases sent by someone to someone, pertaining to what, we cannot discover.

Toward the final years of the 18th century, after Galvani's discovery of animal electricity, Salvà formulated a revised proposal for the telegraph using freshly severed frogs' legs as the indicators. Each leg, when stimulated by the spark, would dance and in so doing, jerk a slip of paper on which the corresponding letter of the alphabet had been written. In the first decade of the new century, after Volta's invention of the electrochemical battery, Salvà proposed a scheme that proves politically correct to this day: electrical current flowing through the wires causes electrolytic decomposition of water, the resulting bubbles of hydrogen serving to indicate the letter selected. There is historical evidence that this last system was actually realized in the early years of the new century, transmitting messages over a distance of several kilometers in 1804. Another thirty years were to pass before the American painter Samuel Morse discovered and solved what was by then a »sweet« problem, building

his first working telegraph model on a canvas stretcher. Morse's critical contribution, the code of dots and dashes, not only allowed the transmission of any written message on a single wire, but provided the prototype of a digital metaphor for communication that has reached its apex in our own time.
During the last decade of our own century the internet has been touted as inherently democratic, a tool that unites nations and classes with brotherly shareware, that brings information and tidings of freedom to oppressed peoples yearning to become cheap labor, a force to be feared by dictators. News stories surrounding the internet in regard to freedom of speech issues and popular uprisings in third world nations sound a familiar tune. Democracy and Electricity, the regicide and the king's messenger, have mounted their horses and are once again coming to deliver us. The mechanisms and metaphors of *The Messenger* may serve to remind us that there is no inherent bidirectionality in electrical communication, that a body can be a telegraph as well as a recipient of a message, that who is transmitting what to whom is often lost in the speed and coded immateriality of electricity.

The Messenger

1998

Es wurde ihnen die Wahl gestellt, Könige oder der Könige Kuriere zu werden. Nach der Art der Kinder wollten sie alle Kuriere sein. Deshalb gibt es lauter Kuriere, sie jagen durch die Welt und rufen, da es keine Könige gibt, einander selbst die sinnlos gewordenen Meldungen zu. Gerne würden sie ihrem elenden Dasein ein Ende machen, aber sie wagen es nicht wegen des Diensteides. — Kafka[1]

1
Franz Kafka zitiert nach: Friedrich Kittler, *Aufschreibesysteme 1800/1900*, München: Wilhelm Fink Verlag 1985, S. 344.

The Messenger ist eine internetgesteuerte Installation, die auf frühen Vorschlägen für elektrische Telegrafen, insbesondere denen des katalanischen Wissenschaftlers Francesc Salvà, beruht. Wie in vielen meiner Arbeiten untersuche ich darin die in Technologien — vor allem vergessenen und verwaisten Technologien — eingelagerten Metaphern und versuche, deren Herkunft zu ermitteln, sie als Depots unausgesprochener allgemeiner Vorstellungen und Träume zu lesen. In *The Messenger* spüre ich anhand des Telegrafen dem Verhältnis von Elektrizität und Demokratie nach, werfe die Frage auf, was elektrische Telekommunikationstechnologien zu unserer Solidarität und Isolation, unserer Gleichheit und Unterdrückung, zum Reichtum unserer Erfahrungen und zur Ungewissheit unseres Lebens beigetragen haben.
In *The Messenger* landen E-Mails aus aller Welt auf einem Rechner in der Galerie Metronom in Barcelona und werden über drei bizarre telegrafische Empfangsgeräte Buchstabe für Buchstabe »ausgedruckt«. Der zentrale Empfänger, ein Set von kreisförmig angeordneten sprechenden Schüsseln, gibt die Einzelbuchstaben in 26 unterschiedlichen Stimmen wieder. Männer, Frauen, Schulkinder und Rentner erheben bei Aktivierung des jeweiligen Buchstabens scheppernd ihre Stimme. Der hallige Klang der Blechschüsseln verleiht jeder eine eigene Resonanz und hebt sie dadurch von den anderen und vom akustischen Raum der Galerie ab. Aufgereiht in der linken Nische der Galerie steht ein corps de ballet aus 26 Miniaturskeletten, die alle einen kleinen Poncho mit einem Buchstaben des Alphabets tragen. Wird ein Buchstabe aktiviert, springt das zugehörige Skelett in die Luft, sodass mit dem Eintreffen der E-Mail-Nachrichten aus dem Internet eine Art Totentanz entsteht. In der rechten Nische befindet sich der dritte Empfänger, eine Reihe von 26 alten Glasgefäßen, die mit einem Elektrolyt gefüllt und mit zwei Elektroden bestückt sind, wovon eine die Form eines Buchstaben besitzt. Je nach Stromzufuhr verfärben sich die Elektroden von metallisch glänzend zu matt schwarz und es lagern sich Wasserstoffblasen daran an. Das System verfügt über keinerlei Speicher oder Verständnis für die übermittelten Botschaften. Sofern die Signale nicht beobachtet, mitgeschrieben oder gedeutet werden, ist die Installation eine sinnentleerte letzte Ruhestätte für Nachrichten, die um die ganze Welt gereist sind, um hier zu verenden. Man könnte dabei an Babel denken, an das Fallen eines Baums in einem stillen Wald, an den ersterbenden Schrei des letzten überlebenden Menschen. Dass die verschollene oder sinnlose Botschaft heute zu einer so alltäglichen Erfahrung geworden ist, liegt nicht zuletzt auch an unserer wachsenden Abhängigkeit von Elektrizität als vorherrschendem Kommunikationsmedium.

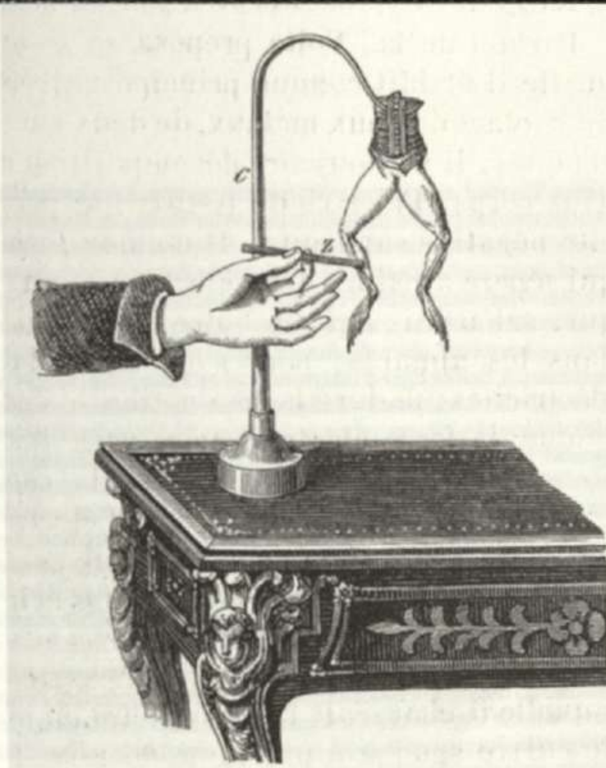


Fig. 347. — Grenouille de Galvani.

Obzwar schon seit dem Altertum bekannt, wurde die Elektrizität erst in der ersten Hälfte des 18. Jahrhunderts in gewissen Aufklärerzirkeln zu einem Gegenstand intensiven Interesses. Dass es sich bei den frühen Experimentatoren um privilegierte und gebildete Leute handelte, geht schon aus den Materialien hervor, die sie zur Erzeugung elektrostatischer Ladungen verwendeten: Pelz, Bernstein, Siegellack. Auch dass sie in kalten Klimazonen lebten, war eine Voraussetzung für die regelmäßige Beobachtung elektrostatischer Prozesse, denn nur in kalten und trockenen Umgebungen kann sich Reibungselektrizität ansammeln und entlädt sich nicht ständig über die feuchte Luft. Mit der Erfindung der Leidener Flasche, der primitiven Urform des Kondensators, ergab sich die Möglichkeit zur Akkumulation größerer Mengen elektrischen Stroms. Und nicht zufällig hatten viele von denen, die sich so für die Elektrizität interessierten, auch ökonomische Interessen, was sie dazu veranlasste, gleichzeitig mit sozialen Reformen zu experimentieren. Als herausragendes Beispiel kommt einem Benjamin Franklin in den Sinn, aber es gab derer noch viele andere. Die Geschichte des elektrischen Telegrafen ist aufs Engste mit der Geschichte der Demokratie verknüpft. Ihre Mythen sind bis heute unauflöslich miteinander verbunden.
Demokratie und Elektrizität, die beiden weißen Ritter der Moderne, begaben sich eines nicht genau bekannten Tages Mitte des 18. Jahrhunderts auf ihre Abenteuerfahrt. Was die Demokratie betrifft, so zeigte sie sich in Rous-

Walls in the Air

2001

It was the year of the Big Bad Bombs. I turned eight and got promoted to my own room in the semi-finished attic of our old house. It had a spooky crawl space behind the wall, away under the eaves. Somehow I made peace with the monster on the other side of that wall and, on rainy afternoons, would curl up in that place with my comics and listen to the roof sing and tap its toes.
There was an old 1930s Zenith shortwave radio in that attic and I listened to its sounds, too. Like nerves extending beyond the body, the radio reached out and gave my imagination a web on which to catch the sounds of the universe. I wondered where the voices came from and what other distant interiors lay hidden inside the tangle of tubes and condensers. I wondered if I shouted loudly enough into the loudspeaker if others could hear me. Late into the night I listened to the chatter of voices in exotic tongues and to the never-ending concertos of slow glissandi and commanding drones, artifacts of radio interference that I took to be music from countries that floated in the sky above the ocean.
As I grew to understand more about the nature of monsters and walls and radios that year I began to hear about other places where people were not free to listen to the radio or read comic books. A child's garden of Orwell budded within my mind. Hiding behind my wall I would imagine the other side, a family hushed in their home secretly listening to their radio. Could I talk to them through my old Zenith? Could I send them a message of hope and friendship? Would it make me feel less afraid?
This piece is my recollection of that time. Were I to re-experience that view from inside the radio now I suppose my primary identification would be with Mary Shelley's clueless medical assemblage, peering through the chink in the wall of the woodshed, trying to catch some rays of insight. But memory isn't like re-experiencing. It is always accompanied by the events of everyday life. As the fears and dreams of our memories are still heard superimposed on the music of our lives, so the ghosts and monsters of those years coexist in this radio, intertwined with the strains of today's popular music, talk shows and traffic reports. By tuning the dial you can listen across those waves.

Es war das Jahr der großen bösen Bomben. Ich war gerade acht geworden und bekam im halbfertigen Dachboden unseres alten Hauses ein eigenes Zimmer. Hinter der Wand befand sich ein unheimlicher, niedriger Raum, der sich bis zur Dachkante vorschob. Irgendwie gelang es mir, mit dem dort hausenden Monster Frieden zu schließen, und an regnerischen Nachmittagen ließ ich mich darin mit meinen Comics nieder und lauschte dem Singen und Knacken des Dachs.
Auf dem Dachboden befand sich auch ein Zenith-Radio aus den 1930er Jahren, dessen Klängen ich ebenso lauschte. Wie über den Körper hinausreichende Nerven war das Radio eine Verbindung zur Außenwelt und gab meiner Fantasie ein Netz in die Hand, mit dem ich das Gemurmel des Universums einfangen konnte. Ich fragte mich, woher die Stimmen kamen, und was für andere, ferne Zimmer hinter dem Gewirr aus Röhren und Kondensatoren lagen. Ich fragte mich, ob mich andere hören könnten, wenn ich nur laut genug in den Lautsprecher riefe. Ich lauschte bis spät in die Nacht dem Gemurmel der Stimmen und den endlosen Konzerten aus zähen Glissandi und mächtigen Brummtönen — Artefakten der Interferenz, die ich für Musik aus Ländern hielt, die im Himmel über dem Meer schwebten.
In diesem Jahr, in dem ich etwas über das Wesen von Monstern, Wänden und Radios lernte, erfuhr ich auch von Orten, an denen Menschen nicht einfach Radio hören oder Comic-Hefte lesen konnten. Ein kindlicher Orwell-Garten begann in meinem Kopf zu blühen. Versteckt hinter meiner Wand stellte ich mir die andere Seite vor: eine in ihrer Wohnung heimlich vor dem Radio sitzende Familie. Ob ich wohl über mein altes Zenith-Radio mit ihnen sprechen konnte? Ob ich ihnen damit eine Nachricht senden konnte, die ihnen Mut und Hoffnung macht? Würde ich dann weniger Angst haben?
Diese Arbeit ist meine Erinnerung an diese Zeit. Würde ich diesen Blick aus dem Inneren des Radios heute nacherleben, identifizierte ich mich wohl mit Mary Shelleys unbedarfter Medizin-Assemblage, spähte durch einen Spalt in der Wand eines Holzschuppens, um wenigstens ein paar vage Eindrücke zu erhaschen. Aber Erinnerung ist kein bloßes Nacherleben. Sie geht stets mit den Ereignissen des täglichen Lebens einher. So wie die Ängste und Träume unserer Erinnerung immer noch in der Musik unseres Lebens mitschwingen, so leben in diesem Radio die Monster und Geister jener Jahre neben Fetzen heutiger Popmusik, Talkshows und Verkehrsberichte. Mit dem Drehen des Sendersuchknopfs kann man sich quer durch diese Wellen hören.

that enables us to distinguish from each other the sounds proceeding from different sonorous bodies.

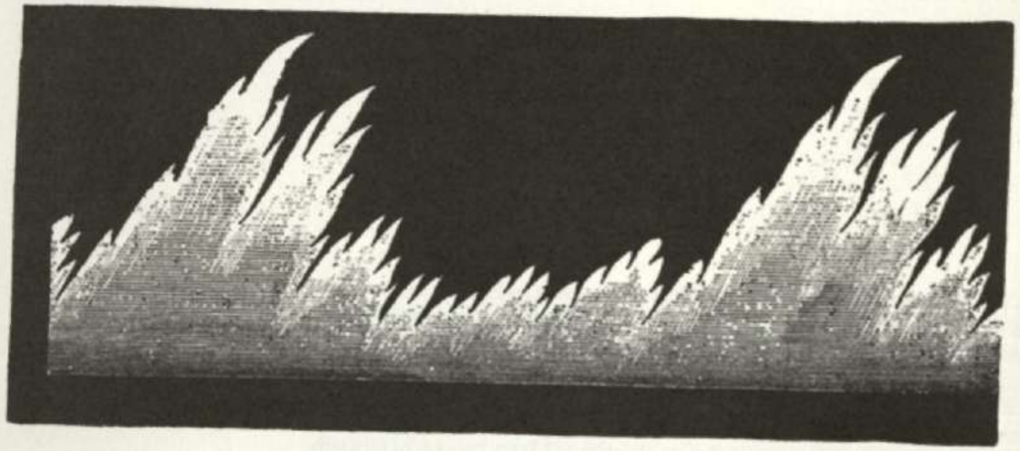


FIG. 160.

We are now prepared to make another step in advance,

1 manometric flame recording of the sound of the letter »R« From: John Augustine Zahm (1851–1921), *Sound and Music*, Chicago, 1892, p. 35

2 Édouard-Léon Scott de Martinville's Phonautograph, 1857

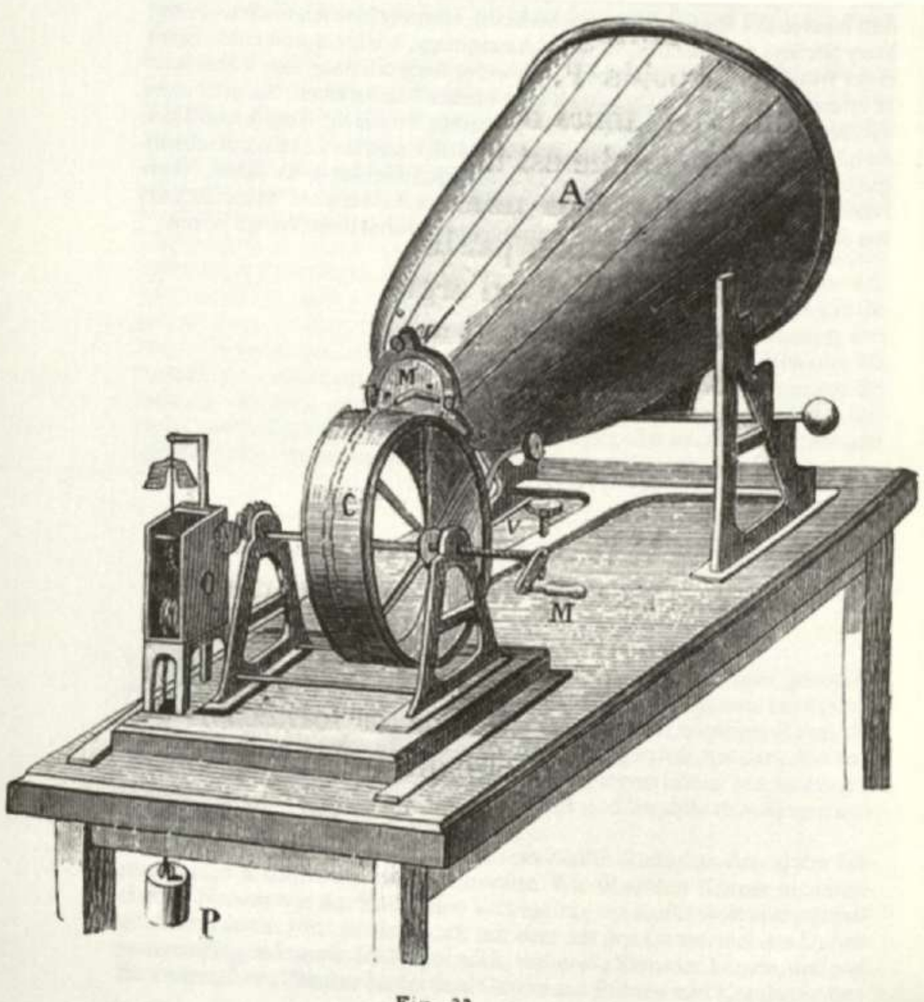


Fig. 33.

According to Scripture

2002

In the present project I have drawn on a number of illustrations and engravings of sound vibrations from old physics and acoustics texts, many of them predating the invention of the phonograph, and translated them into short sound files. None of these sounds have ever been heard since their brief transit from vibration to inscription in the physics laboratories during the years 1853 to 1890. These are in effect, the most ancient recorded sounds now available to our ears.[1]

Some of the recordings are of patently banal sound sources: sirens, tuning forks and the like, and were created to form a kind of baseline for the visual interpretation of sound phenomena. They served to calibrate, verify and unify a host of laboratory practices and experimental apparatus with mathematical and theoretical studies. Other traces were intended to be objects of study in incipient fields, such as phonology and linguistics, and offer unique glimpses into particular sound moments from what is supposed to be a silent era. While none of these is comparable in import to the microwave echoes of the big bang, they are sometimes astonishingly clear and accurate, however brief. Their very existence and their present decoding may offer another interesting footnote to the history of the recording media; also, certain artifacts characteristic to them present some interesting questions and speculations in the ongoing debates about the transition from human writing to machine writing as it applies to media theory.

1
Is the sound of an existing Roman era bell, for example, dating from the third century a more ancient sound? For this to be the case we would have to think of the bell itself as an encoding of some »sound«; that sound, in turn, would have to include the splashing of molten brass, the beating by smiths' hammers etc. But the sound the bell produces in its current use is far from being a recording of these sounds. In my scheme no sound exists naked and no moment of sound can be recorded without its attendant accompaniment of stray vibrations in this gedanken example in the form of strike-tone (the material with which the bell was struck plus the force and neccesarily the quivers of muscles imparting that force, muscle-sound having its own history (see Oster, G., »Muscle sounds«, Sci. Am. 250, 1984: 108–114)) and the admixture of sounds from the environment. Therefore for the purposes of this project I do not consider the hypothetical bell itself to be either the substance or the carrier of a more ancient sound.

The philological efforts of the 18th century bore much fruit in the era that followed. Monumental efforts like Champollion's that succesfully decoded lost languages served as proof that secrets long hidden could indeed be deciphered. That the romantics saw in the traces of phenomena the writing of Nature is well known; that this writing might be read and interpreted was the project of numerous scientific endeavors of the nineteenth century: stratigraphy and paleontology, fossils and the origin of species, spectrography and the signatures of the elements. Among early efforts to fix the traces of sound, the figures of Ernst Chladni drew much attention early in the 19th century, including the accolades of Napoleon and the mathematical attentions of Sophie Germain. These two dimensional patterns were created by lycopodium powder dancing on a metal plate that was drawn into vibration with a violin bow. As it happens, these figures, though visually replete with meaningfulness, turned out to have more to reveal about the shapes and attachments of the metal plates than the sound itself. Still, the hunt was on for a species of automatic writing that would uniquely reveal the inner nature of sound vibrations and fix them for systematic visual scrutiny and measurement. The phonograph that was to provide verification of its own data by reproduction was still a distant glimmer.

A host of machines and methods were devised to fix the traces of sound, among them optical devices. Part musical instrument, part camera, part chart recorder, they appear as the mechanical equivalent of the chimeras of ancient legend. The manometric flame, a product of the prolific Parisian instrument maker Rudolph Koenig, used a rotating mirror to display the variations in the height of a flame excited by sound waves as a time sequence. These images figure prominently in several of the early texts, but the precise method by which the visual observation was fixed and transfered to printing plates in the texts is uncertain. The phonautograph of Léon Scott in 1857 was a major breakthrough in the automatic translation of sound vibrations to script. A horn concentrated sound on a membrane coupled to a hog-bristle. The bristle rested lightly on a rotating drum covered with a piece of paper lightly coated with lampblack. As the drum turned it advanced minutely on a screw creating a long helical trace that wrote out the variations of air pressure as

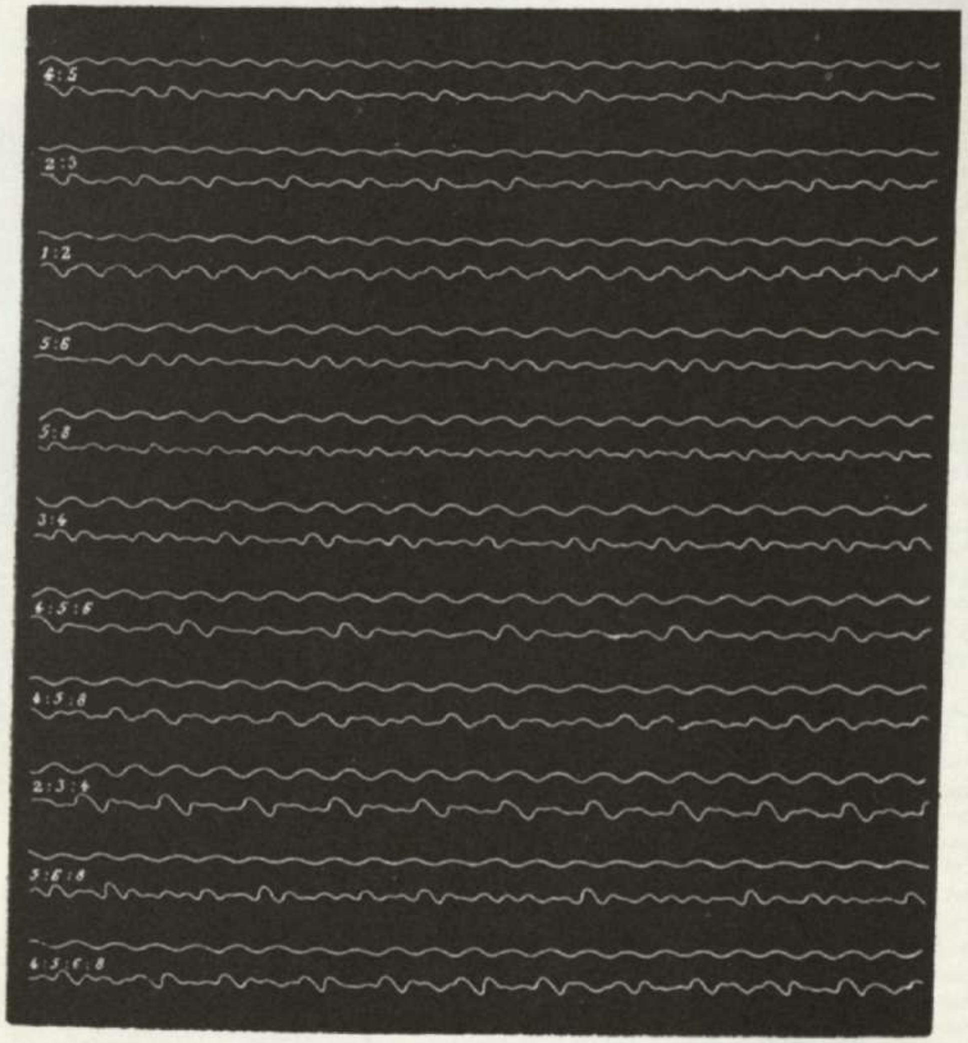


FIG. 28.

3 ratios of multiple tuning forks sounding simultaneously. Zahm, p. 73

slight wiggles in the line. Fine wiggles were created by high frequencies, broader strokes by lower ones; larger deviations from the center line were the result of louder sounds. This gibed well with the currently gestating theory of sounds. In fact, combination tones could be deciphered as regular and evolving patterns, waves that could be visually analyzed to reveal their constituent components, offering proof that a single point could indeed convey multiple superimposed sounds. Scott foresaw in the ramifications of his machine a whole new science and postulated its use in linguistic studies and even as the basis for a new literature, all the time focusing on the handwriting-like quality of the phonautograph traces.[2]

These traces presented incontrovertible evidence of the nature of sound, the basis of a scripture of nature that would promise to be above doubt, interpretation and beyond the reaches of error and fraud. The simplicity of the phonautograph seemed to insure that its product was as real as could be. Yet as we now decode and listen to these ancient sounds, it is evident that errors crept in to these automatically dictated writings of divine nature. These were manifold: misidentification is one reason; since there was no way to replay the traces and verify the content, traces shown in these pages are sometimes incorrectly identified in the texts, for example the 5:6 ratio/interval in plate 3 is actually a 5:4 ratio/interval; Other misidentifications are more suspect. Within the re-translation to sound carried out in my project it is quickly apparent that Eli Whitney Blake's traces »Hello how do you do... Brown University«

2
Since the presentation of this work in the 2002 show »Resonanzen« at the Stadtgalerie Saarbrücken, a team of technologists including David Giovannoni, Patrick Feaster and Carl H. Haber at Lawrence Berkeley Laboratories has successfully applied a similar technique to recorded traces made by Léon Scott. Charming renditions of Scott himself singing »Au Claire de la Lune« and other ditties have emerged as even older sound reproductions.

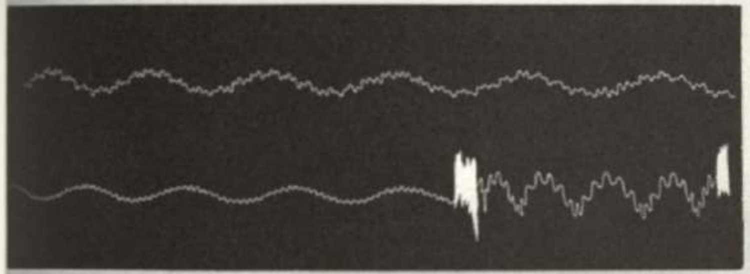


Fig. 125. — Vibrations de sons composés.

...les sons harmoniques montrent bien qu'il s'agit là de sons

4 the sudden transition from a smooth undulating wave to a rapidly oscillating scratch may indicate that the machine abruptly changed speed, and may be thought of as the first recorded »glitch«. From: Amédée Guillemin (1826–1893), *Le monde physique*, Paris 1880–1885, p. 180

appear spurious and contain none of the sounds purported by the author.[3] We can sometimes hear the artifacts of the recording machines themselves (the experimental apparatuses). The trace in plate 4 betrays the glissando of a machine slowing down to a stop.

Another interesting source of error is not readily apparent to the eye, but emerges as we process the images to convert graphic into sound files: In some cases the traces seem to go backward in time, however briefly, and confound the ability of my algorithm to decide which of two simultaneous points is actually the right one. One physical cause of this backward motion in original phonautograph traces is the lissajous-like wiggling of the pig bristle used as a stylus in early phonautograph devices. Another origin of this error can be traced, I suspect, to the confusion of machine writing with handwriting, for the traces of the phonautograph had to be manually converted from scratches in lampblack into reproducible figures on copper plates.

The work of converting machine-generated images to drawings and then to engraving was the work of cadres of trained engravers whose skill was to create reliable verisimilitudes of the figures presented to them by the scientists. Nonetheless, certainly the hand of the engraver emerges from the page to re-

3
This is disputed by Patrick Feaster (personal correspondance), who writes that he has been able to decode the sounds intelligibly.

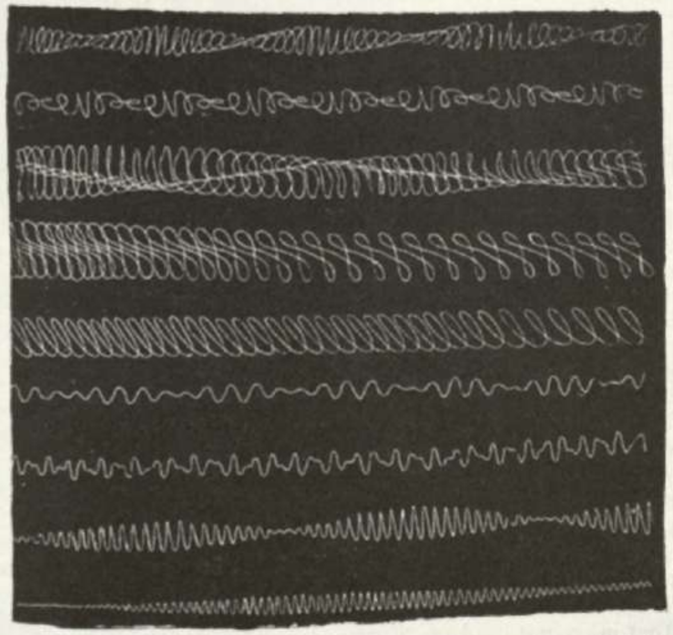
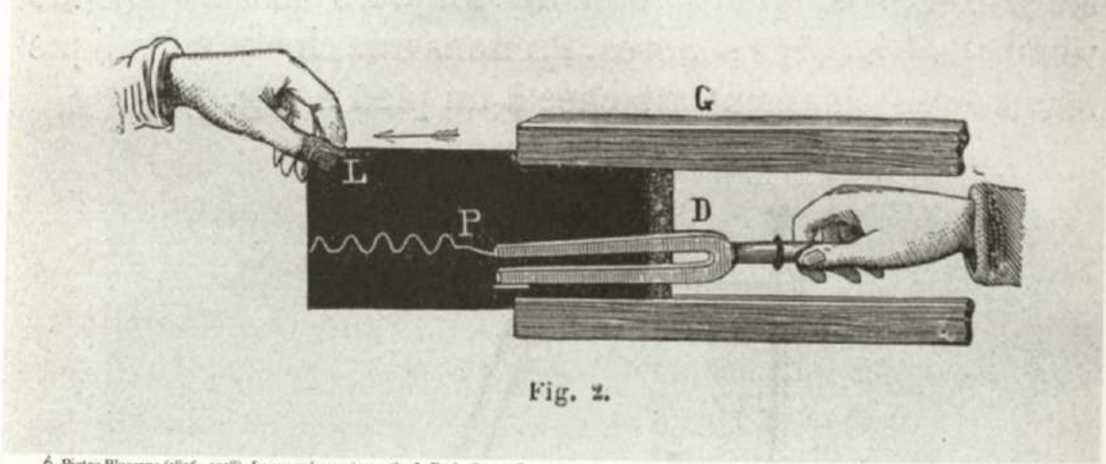


FIG. 10.—An illustration of the movements of sound "waves," or vibrations, as recorded by the phonautograph. These represent musical sounds; the lines produced by the human voice are extremely irregular.

5 complex handwriting-like curves produced by the gyrations of the pigs bristle stylus. From: James E. Homans, *ABC of the Telephone*, New York, 1912



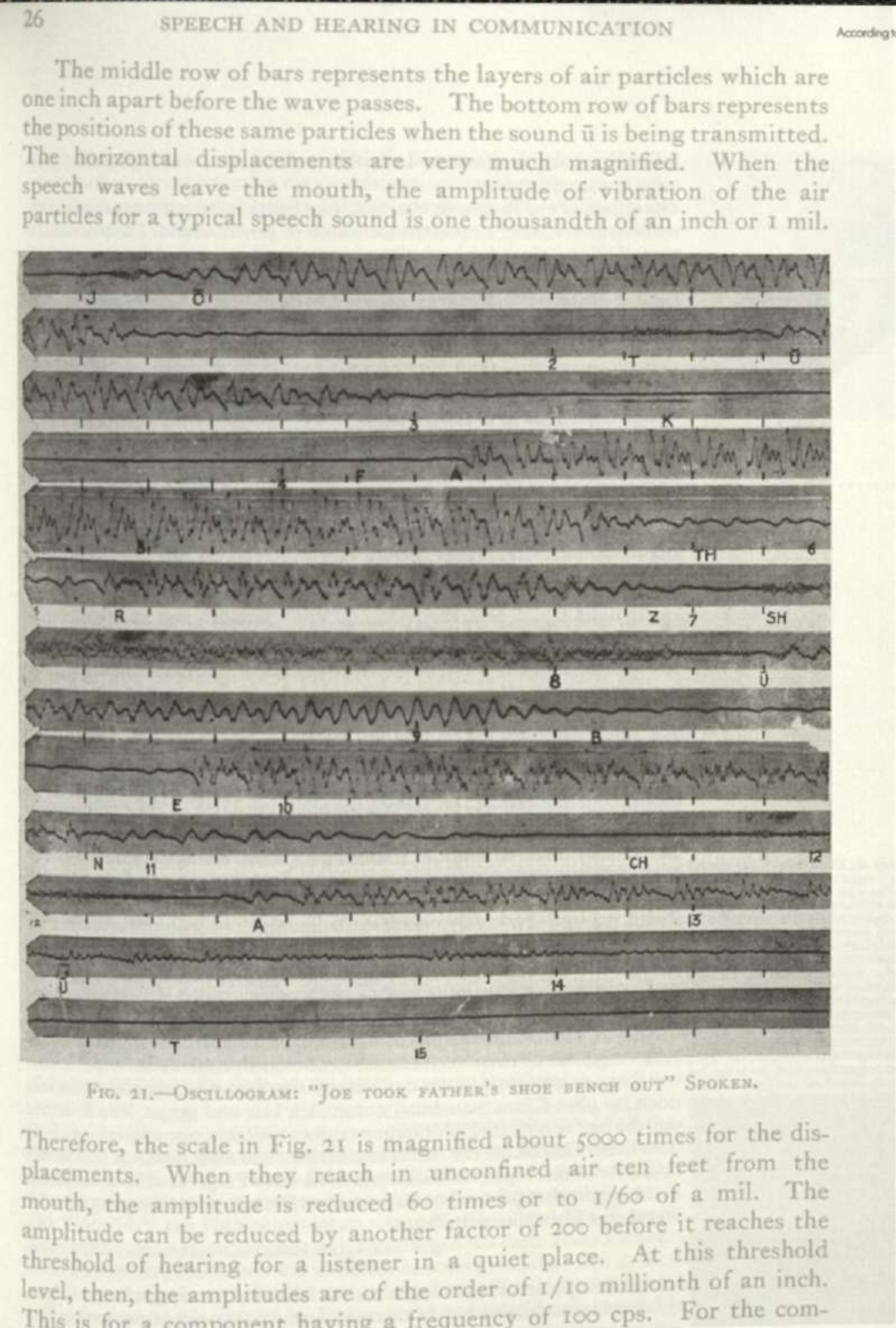
6 Pietro Blaserna (1836–1918), *Le son et la musique*, 4th ed., Paris 1892, p. 8

animate the machine-generated script. Many of these images were copied from one edition to another, thence to translation and popular knockoff. Certain conventions of hand drawn lines may be responsible for the creation of these impossible time or direction-reversals.

The disembodied hands that attend the instruments in engravings of demonstrations of the phonautograph and related sound-writing devices are another source of curiosity. These experimental hands, a hallmark of 18th century representation of scientific experiments, persist in a number of these illustrations. We may wonder if the engravers, recognizing the similarity of their work and the apparatuses and processes they were being employed to represent, felt some connection with the phonautograph's needle. Sometimes amusingly gendered and divided into engraver and engravee, we wonder if the hands depicted might be less those of the gentleman-experimenter but echoes of the hand of the engraver who created the plate, like Escher's drawing hand.

As a scientific genre this particular style of graphic traces of sound persisted well into the 20th century, and even in our own time adorn the pages of scientific and acoustic journals as well as the windows of our digital sound editing software. Some of the sounds in my project post-date the invention of the phonograph, but are deciphered and played here because of their contibution to the history of sound. In particular Harvey Fletcher's hallowed »Joe took father's shoe-bench out« was a real delight to hear as its scratchy tones proceeded from the silent pages of the book to the scanner, through hand corrections in Photoshop, then Max/MSP to the raspy voice on my loudspeaker. Other traces, like the manometric flames posed a series of vexations. We know what they are supposed show about sound with respect to frequency and amplitude, but they also record artifacts of flame combustion dynamics and infrasonic variations. Already forsaken as potential revealers of vowel color the manometric flame was completely abandoned as a tool for illumination of sound quality as soon as superior photographic methods such as Dayton Millers phonodeik superseded it. Even more recent traces like the Russian »Aaah« that present an alluring pair of physical and acoustic replicas, offered challenges not so much because of their obscure coding systems, but because the conventions of halftone reproduction, to which our eye is favorably accustomed, make the definite line that the machine can follow quite fractal in nature. Many of these brief blips are sounds only a mother could hear.

I made a number of decisions and judgements regarding my own interpretive licence in presenting these traces as sound. In some cases I chose to use my hand and eye to interpolate apparently missing portions of the trace. In other cases, such as »Aaah«, I applied injudicious amounts of graphic processing to force a result that was finitely decodable. Throughout this process I was aware of my own interventions, sometimes practical, sometimes playful, as an ongoing part of laboratory and studio practices that have really never ended for these traces. In offering them here for audition and speculation my


26 SPEECH AND HEARING IN COMMUNICATION

The middle row of bars represents the layers of air particles which are one inch apart before the wave passes. The bottom row of bars represents the positions of these same particles when the sound ū is being transmitted. The horizontal displacements are very much magnified. When the speech waves leave the mouth, the amplitude of vibration of the air particles for a typical speech sound is one thousandth of an inch or 1 mil.

FIG. 21.—OSCILLOGRAM: "JOE TOOK FATHER'S SHOE BENCH OUT" SPOKEN.

Therefore, the scale in Fig. 21 is magnified about 5000 times for the displacements. When they reach in unconfined air ten feet from the mouth, the amplitude is reduced 60 times or to 1/60 of a mil. The amplitude can be reduced by another factor of 200 before it reaches the threshold of hearing for a listener in a quiet place. At this threshold level, then, the amplitudes are of the order of 1/10 millionth of an inch. This is for a component having a frequency of 100 cps. For the com-

7 a film recording traced by a beam of light produced a detailed trace which may be converted to a sound file with very little distortion. From: Harvey Fletcher, Speech and Hearing, New York, 1929, p. 26.

8 recorded waveform of the Russian vowel »Aaah« printed with low resolution halftone screen



intention is to pass them on to further experimental and interpretive recycling as sound samples.
The efforts of the Romantic era, as Kittler has pointed out, were focused on reading and writing, not on the recreation of primal sound. The mechanization of writing, though, eventually suggested, even demanded that these scripts be played anew. That the earliest mute records treated here are now reduced to their electronic media equivalents, processed and played by computer, is evidence that the great project of automatic writing, reading, deciphering and hallucinating proceeds like the well oiled machines of yesteryear.

Technical note: The traces were scanned on a flatbed scanner, extracted and isolated by a number of processes in Photoshop, then transformed into audio files via a custom patcher in Max/MSP. The sounds were then presented in the exhibition as .aiff files played back on a conventional CD player.

According to Scripture 2002

Im vorliegenden Projekt greife ich auf eine Reihe von Schallwellengrafiken aus alten, meist vor der Erfindung des Phonographen entstandenen Physik- und Akustiktexten zurück und übersetze sie in kurze Tondokumente. Keiner dieser Klänge ist seit seiner kurzen Existenz bei der zwischen 1853 und 1890 in irgendeinem Physiklabor durchgeführten Umwandlung von der Schwingung zum Schrieb je wieder gehört worden, so dass man hier durchaus von den ältesten, dem Ohr heute zugänglichen Klängen sprechen kann.[1] Einige dieser Aufnahmen stammen von offenkundig banalen Schallquellen wie Sirenen, Stimmgabeln und dergleichen und wurden vor allem zu dem Zweck erzeugt, eine Art Grundkurve für die visuelle Interpretation von Klangereignissen zu erstellen. Sie dienten zur Eichung, Prüfung und Vereinheitlichung einer Fülle unterschiedlicher Laborverfahren und Versuchsapparaturen in mathematischen und theoretischen Studien. Andere Schallkurven sind als Studienobjekte in neu entstehenden Gebieten wie der Phonologie und Linguistik entstanden und bieten einzigartige Einblicke in bestimmte akustische Augenblicke einer vermeintlich lautlosen Epoche. Auch wenn keiner von ihnen so gewichtig ist wie das Mikrowellenecho des Urknalls, so sind sie doch bei aller Kürze manchmal erstaunlich klar und genau. Ihre Existenz und die hier vorgelegte Decodierung ergeben vielleicht eine interessante Fußnote in der Geschichte der Aufnahmemedien; und manche für sie kennzeichnende Artefakte regen vielleicht zu interessanten Fragen und Spekulationen in der gegenwärtigen medientheoretischen Debatte zum Übergang von der Hand- zur Maschinenschrift an.

1
Oder ist etwa der Klang einer Glocke aus der Römerzeit — sagen wir aus dem 3. Jahrhundert — älter? Das wäre nur dann der Fall, wenn wir uns die Glocke selbst als Codierung eines »Klangs« denken; zu diesem Klang würde etwa das Blubbern geschmolzener Bronze, das Klopfen von Schmiedehämmern usw. gehören. Der Klang, den die Glocke in ihrem gegenwärtigen Gebrauch hervorbringt, ist weit davon entfernt, eine Aufzeichnung solcher Geräusche zu sein. In meinem System existiert kein Klang für sich, und kein Klangmoment kann in diesem Gedankenbeispiel eines durch Anschlag erzeugten Tons ohne die ihn begleitenden Streuschwingungen (des Materials und der Kraft, mit denen die Glocke angeschlagen wird, sowie den bei der Ausübung dieser Kraft unweigerlich entstehenden Muskelvibrationen, wobei der Muskelton seine ganz eigene Geschichte hat (vgl. Oster, G., »Muscle sounds«, Sci. Am. 250, 1984: 108–114)) und die Beimischung von Umgebungsgeräuschen aufgenommen werden. Daher betrachte ich die hypothetische Glocke im Zusammenhang mit diesem Projekt weder als Substanz noch als Träger älterer Klänge.



← 1 Manometrischer Stimmschrieb vom Buchstaben »R« Aus: John Augustine Zahm (1851–1921), *Sound and Music*, Chicago, 1892, S. 351

Die philologischen Bemühungen des 18. Jahrhunderts trugen in der folgenden Epoche reiche Früchte. Monumentale und erfolgreiche Projekte zur Entzifferung toter Sprachen wie das von Champollion, waren ein Beleg dafür, dass lange verborgene Geheimnisse tatsächlich gehoben werden können. Dass die Romantiker in diesen Spuren die Urschrift der Natur erblickten, ist wohlbekannt; diese Schrift lesbar zu machen und zu deuten, war das Ziel zahlloser wissenschaftlicher Unternehmen des 19. Jahrhunderts: Stratigraphie und Paläonthologie, Fossilien und die Entstehung der Arten, Spektrographie und die Signatur der Elemente. Unter den frühen Versuchen, Klangspuren festzuhalten, erregten diejenigen von Ernst Chladni Anfang des 19. Jahrhunderts die größte Aufmerksamkeit, die bis hin zur Auszeichnung

durch Napoleon und zur mathematischen Beachtung durch Sophie Germain reichte. Erzeugt wurden die zweidimensionalen Figuren mittels einer mit Lycopodiumpulver bestreuten Metallplatte, die mit einem Geigenbogen in Schwingung versetzt wurde. Wie sich zeigen sollte, haben diese vor Bedeutung strotzenden visuellen Figuren mehr mit der Gestalt und Aufhängung der Metallplatten zu tun als mit dem eigentlichen Klang. Aber die Jagd nach einer Form automatischen Schreibens, das das innerste Wesen von akustischen Schwingungen offenbart und es für die systematische visuelle Überprüfung und Messung festhält, war damit eröffnet. Der Phonograph, der es ermöglichte, die gespeicherten Daten durch deren Reproduktion zu verifizieren, lag noch in weite Ferne.

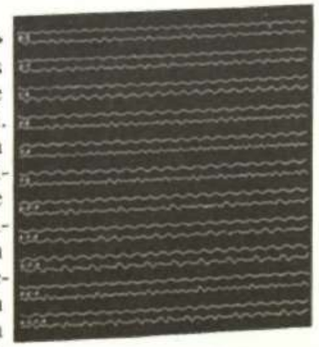


2 Édouard-Léon Scott de Martinville's Phonautograph, 1857 →

Zur Aufzeichnung von Klangspuren wurde eine Vielfalt von Maschinen und Methoden ersonnen, unter denen sich auch optische Geräte befanden. Teils Musikinstrument, teils Kamera, teils Diagrammschreiber erscheinen sie als mechanisches Äquivalent der Chimären aus den Sagen der Antike. Bei der manometrischen Flamme, einem Produkt des überaus produktiven Pariser Instrumentenbauers Rudolph Koenig, wurden die Höhenvariationen einer akustisch in Schwingung versetzten Flamme mithilfe eines rotierenden Spiegels im zeitlichen Ablauf dargestellt. Diese Grafiken spielen in mehreren frühen Texten eine wichtige Rolle, doch wissen wir nichts Genaues über die Methode, mit der die visuelle Erscheinung fixiert und auf die Druckplatte übertragen wurde. Der 1857 von Léon Scott erfundene Phonautograph stellte eine bahnbrechende Entwicklung in der automatischen Übersetzung von akustischen Schwingungen in Schrift dar. Dabei wurde der Schall mit einem Trichter auf eine mit einer Schweineborste versehene Membran gebündelt. Die Borste lag leicht auf einer rotierenden Walze auf, auf der sich ein fein mit Lampenruß überzogenes Blatt Papier befand. Wurde die Walze gedreht, bewegte sie sich auf einem Gewinde langsam vorwärts, so dass eine lange spiralförmige Linie entstand, in der sich die Druckschwankungen als zarte Wellen abbildeten. Bei hohen Frequenzen entstanden dünne, bei niederen Frequenzen dickere Wellenlinien, laute Klänge schlugen sich in stärkeren Abweichungen von der Mittellinie nieder. Das passte gut zu der sich damals herausbildenden akustischen Theorie. So konnten zusammengesetzte Klänge als sich regelmäßig entfaltende Muster gelesen werden: Wellen, die sich visuell analysieren und in ihre Bestandteile zerlegen ließen, was ein Beweis dafür war, dass ein einziger Punkt tatsächlich mehrere, übereinander geschichtete Töne transportieren konnte. Scott glaubte, seine Maschine würde eine gänzlich neue Wissenschaft hervorbringen und sagte ihre Verwendung in der Linguistik und selbst als Grundlage einer neuen Literatur voraus, hatte dabei aber stets die handschriftliche Qualität der Phonautogramme im Blick.[2]

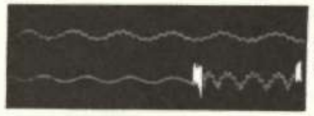
2
Seit der Präsentation dieser Arbeit im Rahmen der Ausstellung »Resonanzen« in der Stadtgalerie Saarbrücken (2002), hat ein Technikerteam an den Lawrence Berkeley Laboratories, dem u.a. David Giovannoni, Patrick Feaster und Carl H. Haber angehörten, mit einer ähnlichen Methode erfolgreich die Kurvengraphen von Léon Scott entschlüsselt. Auf diese Art entstanden bezaubernde Reproduktionen von Scotts eigenem Vortrag des Lieds »Au Claire de la Lune« und anderer Weisen, also die Wiedergabe sogar noch älterer Klänge.

3 Intervallverhältnisse verschiedener gleichzeitig angeschlagener Stimmgabeln. Zahm, S. 73 →



Diese Klangspuren galten als unwiderleglicher Beweis für das Wesen des Klangs, als Inschrift der Natur, die versprach, über jeden Zweifel und jede Interpretation erhaben und gegen jeden Irrtum oder Betrug gefeit zu sein. Die Einfachheit des Phonautographen schien die Gewähr dafür, dass sein Ergebnis so echt wie nur möglich war. Doch wenn wir diese alten Tondokumente heute decodieren und uns anhören, ist sofort klar, dass sich in diese von der göttlichen Natur selbst diktierten Schriften Fehler eingeschlichen haben. Diese waren ganz unterschiedlicher Art. Einer besteht zum Beispiel in falschen Zuordnungen. Da es keine Möglichkeit gab, die Klangspuren wiederzugeben und ihren Inhalt zu überprüfen, wurden die auf diesen Seiten gezeigten Diagramme in den Texten manchmal falsch bezeichnet. So ist etwa das Intervallverhältnis 6:5 in Abb. 3 in Wirklichkeit ein 4:5 Verhältnis. Andere Fehlbezeichnungen sind problematischer. Bei der in diesem Projekt durchgeführten Rückverwandlung in Audiodateien wird z.B. schnell klar, dass die Klangspur von Eli Whitney Blake: »Hello how do you do... Brown University« allem Anschein nach falsch ist und keinen der vom Autor genannten Klänge enthält.[3]

3
Patrick Feaster bestreitet das in einer persönlichen Korrespondenz, in der er behauptet, er habe die Klänge verständlich entschlüsseln können.



Manchmal hören wir auch die Artefakte der Aufnahmegeräte (der Versuchsapparaturen) selbst. Das Diagramm in Abb. 4 gibt das Glissando einer zum Stillstand kommenden Maschine wieder.

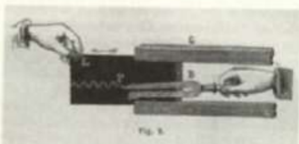
← 4 Der abrupte Übergang von einer regelmäßigen, sanften Wellenbewegung zu einem heftigen raschen Ausschlag zeigt vielleicht einen plötzlichen Tempowechsel des Aufnahmeapparats an und kann insofern als die erste Aufnahme eines »Glitch« gesehen werden. Aus: Amédée Guillemin (1826–1893), *Le monde physique*, Paris 1880–1885, S. 180

Eine weitere interessante Fehlerquelle erschließt sich nicht auf den ersten Blick, wird aber deutlich, wenn man die Grafiken bearbeitet, um sie in Audiodateien umzuwandeln. In einigen Fällen scheinen die Spuren ganz kurz rückwärts zu laufen und die Fähigkeit meines Algorithmus zu überfordern, festzustellen, welcher von zwei simultanen Punkten tatsächlich der richtige ist. Physikalisch kommt diese Rückläufigkeit in den Original-Phonautogrammen u.a. durch die Lissajous-artige Wellenbewegung der Schweineborste zustande, die in den frühen Apparaten als Schreibstift verwendet wurde. Eine weitere Ursache für diesen Fehler liegt aber, so vermute ich, in der Vermischung von Maschinen- und Handschrift, denn die Phonautogramme mussten per Hand von den Kratzspuren im Lampenruß in reproduzierbare Kupferstiche übertragen werden.



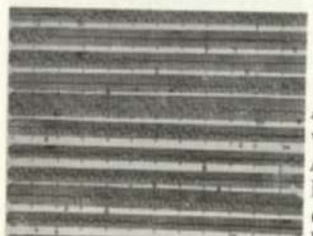
← 5 Von den Drehbewegungen der Schweineborste hervorgerufene komplexe, handschriftenartige Kurven. Aus: James E. Homans, *ABC of the Telephone*, New York, 1912

Die Konvertierung maschinengenerierter Bilder in Zeichnungen und weiter in Stiche war die Arbeit ganzer Kader von spezialisierten Kupferstechern, die in der Lage waren, die ihnen von den Wissenschaftlern übergebenen Abbildungen mit größter Genauigkeit zu reproduzieren. Gleichwohl kommt die Hand des Stechers auf dem Papier ziemlich sicher wieder durch und erweckt das maschinengenerierte Skript erneut zum Leben. Viele dieser Abbildungen wurden von einer Druckausgabe in die nächste übertragen und von dort in die Übersetzungen und populärwissenschaftlichen Ableger. Gewisse Konventionen handgezeichneter Linien sind also vielleicht für die Entstehung dieser unmöglichen Zeit- und Richtungswechsel verantwortlich.



← 6 Pietro Blaserna (1836–1918), *Le son et la musique*, 4. Aufl., Paris 1892, S. 8

Eine Kuriosität stellen auch die frei schwebenden Hände dar, welche in den Illustrationen von Vorführungen des Phonautographen und ähnlicher Klangschreiber die Instrumente bedienen. Die experimentierenden Hände, im 18. Jahrhundert ein typisches Merkmal in der Darstellung wissenschaftlicher Experimente, leben in eine Reihe dieser Illustrationen fort. Man fragt sich, ob die Kupferstecher die Ähnlichkeit zwischen ihrer Arbeit und den von ihnen darzustellenden Apparaten und Prozessen sahen und eine gewisse Verbindung mit der Borste des Phonautographen empfanden. Angesichts der manchmal amüsant nach Schreibgerät und Schriftträger auch geschlechtlich differenzierten Hände, fragt man sich, ob es sich dabei weniger um die Hände des Gentleman-Experimentators als vielmehr um Echos von der Hand des Kupferstechers handelt, der die Abbildung verfertigt hat, wie in Eschers bekannter Zeichnung.



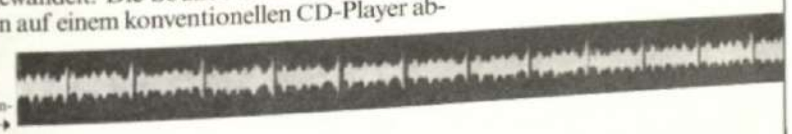
← 7 Eine von einem Lichtstrahl abgetastete Filmaufnahme produzierte eine genaue Kurve, die sich fast verzerrungsfrei in eine Audiodatei umwandeln lässt. Aus: Harvey Fletcher, *Speech and Hearing*, New York, 1929, S. 26.

Als wissenschaftliches Genre hielt sich dieser Stil grafischer Klangspuren bis weit ins 20. Jahrhundert und ziert bis heute die Seiten von Wissenschafts- und Akustikjournalen ebenso wie die Fenster unserer digitalen Audioeditoren. Einige der Klänge in meinem Projekt stammen aus der Zeit nach Erfindung des Phonographen, werden aber hier wegen ihrer akustikgeschichtlichen Bedeutung dennoch entschlüsselt. Vor allem Harvey Fletchers altehrwürdiges »Joe took father's shoe-bench out« war ein echtes Hörvergnügen, als die Kratztöne von den stummen Buchseiten über den Scanner, die Handkorrekturen in Photoshop und schließlich Max/MSP zur rauen Stimme in meinem Lautsprecher geworden waren. Andere Klangkurven wie die der manometrischen Flammen gaben eine Reihe von Rätseln auf. Wir wissen, was sie uns frequenz- und amplitudenmäßig über Klänge mitteilen wollen, aber sie zeichnen auch Effekte der Verbrennungsdynamik und Infraschallvariationen auf. Als potenzielles Mittel zur Vokalfarbenbestimmung schon bald verworfen, wurde die manometrische Flamme mit dem Aufkommen fotografischer Methoden wie Dayton Millers Phonodeik als akustisches Analysewerkzeug schließlich ganz aufgegeben. Selbst noch neuere Graphen wie das russische »Aaah«, das ein reizvolles Paar physikalischer und akustischer Reproduktion bildet, stellten eine Herausforderung dar, und zwar nicht so sehr wegen ihres obskuren Codierungssystems, sondern weil die Konventionen des Rasterdrucks, an die sich unser Auge so gewöhnt hat, die durchgehende Linie, die die Maschine benötigt, ziemlich zersplittert. Bei vielen dieser kurzen Soundclips handelt es sich um Töne, die nur eine Mutter hören kann.

Ich nahm mir bei der Präsentation dieser grafischen Spuren als Audiodateien eine Reihe von interpretativen Freiheiten heraus. In einigen Fällen griff ich auf meine Hand und mein Auge zurück, um offensichtlich fehlende Kurventeile zu ergänzen. In anderen Fällen, wie beim erwähnten »Aaah« betrieb ich einen enormen Bildbearbeitungsaufwand, um ein entschlüsselbares Ergebnis zu erzwingen. Während des gesamten Prozesses war ich mir meiner mal praktischen, mal spielerischen Eingriffe stets bewusst. Ich betrachte sie als Teil einer kontinuierlichen Labor- und Studiopraxis, die für diese Klangspuren eigentlich nie aufgehört hat. Indem ich sie hier zum Hören und Spekulieren anbiete, überantworte ich sie einem weiteren experimentellen und interpretativen Recycling als Soundsamples.

Wie Friedrich Kittler gezeigt hat, war das romantische Zeitalter ganz auf Lesen und Schreiben fixiert, nicht auf die Wiedergabe von Urgeräuschen. Die Mechanisierung des Schreibens aber legte nahe, ja schrie geradezu danach, diese Skripte neu wiederzugeben. Dass die hier verwendeten stummen Aufnahmen aus der Frühzeit der Tonaufzeichnung mit der Bearbeitung und Wiedergabe auf dem Computer auf ihr heutiges Äquivalent in den elektronischen Medien heruntergebrochen werden, macht deutlich, dass das große Projekt des automatischen Schreibens, Lesens, Entschlüsselns und Halluzinierens immer noch auf die gleiche Weise funktioniert wie die gut geölten Maschinen von Gestern.

Technische Anmerkung: Die Klangkurven wurden mit einem Flachbrettscanner eingescannt, in mehreren Bearbeitungsschritten in Photoshop ausgelesen und isoliert, und über ein maßgeschneidertes Patchprogramm in Max/MSP in Audiodateien umgewandelt. Die Sounds wurden in der Ausstellung in Form von .aiff-Dateien auf einem konventionellen CD-Player abgespielt.



8 mit grobem Druckraster wiedergegebene Wellenform des russischen Vokals »Aaah« →







Firebirds

2004

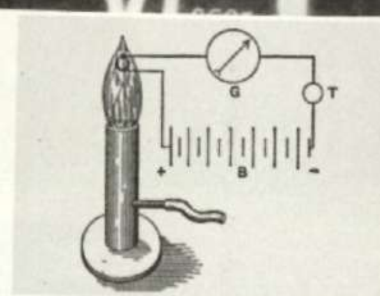
The wireless telegraph is not difficult to understand. The ordinary telegraph is like a very long cat. You pull the tail in New York, and it meows in Los Angeles. The wireless is the same, only without the cat. — Albert Einstein

My work often traverses the untrodden areas of communication technology where the interplay of meaning, materiality and encoding dance round in figures that suggest the uneasy struggles and yearnings that underlie our officially sanctioned notions of utility, efficiency and consumer desirability. I mean to pose questions about the world we have created, to ask how material devices weave their way into our personal relationships, our understanding of the physical universe and our origins, as well as our notions of possible futures.

Firebirds and *Tongues of Fire* are two companion works that examine a power complex of inter-relationships between fire and language from a diverse variety of technical, historical and metaphorical viewpoints. That speech is made of sound is not always apparent as we speak, listen, read and are transported to the inner recesses of conversation. But electronic media, and the radio in particular reconfigured our culture's perception of the relationship







between speech and sound for most of the 20th century. Surely the transformation of speech into signal, signal into wave, to recording and playback make apparent that meaning is forever cast as sound, sound as signal, signal as noise and onward.

For all its power and terror, the course taken by the political leaders' voice is no less technological. In the end, it is only a wave in the air, a scratch in the groove. Sound with all its attendant artifacts of recording, transmission, reception, makes this evident.

Each technology of speech transmission has its technical and social requirements for formation, but also its special conditions for reception. The telephone is real-time, bidirectional and intimate; a telephone conversation is an intimacy within the intimacy of the domestic environment; we are still uncomfortable with speakerphones and conference calls. The phonograph allows its reception to be metered and deferred for collective reception in a domestic space. Radio enforces real-time collective reception. There is no object of fixation other than the radiophonic voice itself, save perhaps a grandiose wooden console with silent glowing tubes. Prior to the radio political speech had remained outside the home in the plazas and conference halls. By speech becoming sound, signal, wave, signal and sound again, home life became politicized. The voice of the leader enters the private domain of the home and hearth, effectively transforming this formerly sacrosanct domain into a realm of public space.

Imagine the arc of wireless, from its earliest glimmerings in the imaginations of physicists like Branly, Crookes and Lodge, all seriously involved with psychical and spirit communications, through the commercial exploits of Marconi, through the amateur-hacker era when every boy dreamed of a personal communication module that would let him talk with friends and imagined romantic interests across space and the broadcasting of pranks (young boys tapping out false coordinates of the sinking Titanic), the military's monopoly



IL DUCE A MILANO.



during the first world war, the era of broadcast, the apex of radio in the 1930s when the voices of political leaders entered the communal domestic space of people around the world, the age of AM radio, rock and roll, and finally the »wireless« legacy we inherit in our mobile phones and Bluetooth peripherals. This vast nowhere all had to come from somewhere.

Among the early inventors, a lonely and lovesick young man sat in his modest apartment in New Haven in 1904, searching for a breakthrough invention in radio to catapult him to fame and fortune. While tapping his Hertzian key he noticed that the flames of his gas chandeliers would jump and ebb with each transmitted dot and dash. Certain that he had discovered a sensitive receiver for radio waves, he wrote up several patents for devices embodying his discovery. Long before the patents were duly issued, De Forest learned that the modulation of the flames was caused not by radio waves, but by the sound of the tapping of his key, thus replicating the discoveries in the 1850s by LeConte and Tyndall. Unperturbed, and possessed by the *idée fixe* that the flame must be the sensitive receiver of Hertzian waves, he forged on. Piggy-backing on work carried out recently by Ambrose Fleming in England, and earlier by Elster and Geitel in Berlin, De Forest began encapsulating his experiments inside light bulbs, replacing the dancing flame with the glowing filament. By insight or perseverance or blind luck, De Forest succeeded in producing, in 1906, the Audion, or vacuum tube, an efficient amplifier that was to make radio the vast medium it later became and usher in the electronic era — television, radar, computers — that dominated most of the twentieth century. De Forest's invention presents us with an intersection in a moment in time — 1906, the age of electric lighting, when the flames of candles and gas jets were everywhere being locked up in glass bottles, and at the same time all the words and messages running through wires were leaking out into Maxwellian space as communication became radiant.

The flames of *Firebirds* are a look at the collision of voice, meaning, material inscription and collective space as it existed briefly at that moment. That sound can transit through gaseous space without solid vibrating elements of the loudspeaker has been a phenomenon studied since the earliest days of electronic technology. In 1924 Lorenz AG of Berlin marketed Masolle and Vogt's »Kathodophone« — basically a triode opened to the air coupled to a small horn that acted as a microphone. In the early 1950s S. Klein of France reversed this principle and described an electrothermal horn loudspeaker. In

1967 three researchers at United Technologies Corporation in Sunnyvale published a paper in *Nature* describing the form of electrothermal transducer used in *Firebirds* — a gas flame, seeded with potassium ions, is made to vibrate the air by being electrically modulated by a voltage. As the air around the flame is instantaneously heated and cooled, expanding waves of sound vibration are produced in the air, creating an omnidirectional sound source. The traces of voice presented in *Tongues of Fire* hark back to an earlier era, when the manometric flame of Koenig served as a significant advance in phonological studies in the 19th century. These traces are made by vibrating a flame by placing a speaking tube in proximity to the gas supply. I followed the descriptions from John Tyndall's *Sound* in constructing the manometric capsule, and, following the example of Dayton Clarence Miller later in the 19th century, adapted an old bellows-camera into a slit scan recording device to inscribe the flame variations on 120 roll Ektachrome film in realtime. These images are the precursors of the oscilloscope traces that followed, and of the graphical displays now seen in our audio editing software. Again I chose political speech, as much for the familiarity of its cadence as for the reminder it provides of the dangers of fire, friendly or otherwise.

Firebirds 2004

Der Funktelegraf ist nicht schwer zu verstehen: Ein herkömmlicher Telegraf ist so etwas wie eine sehr, sehr lange Katze. Man zieht in New York an dem Schwanz und sie miaut in Los Angeles. Beim Funken läuft es genauso, nur ohne Katze. — Albert Einstein

Meine Arbeiten durchstreifen oft die unbekannten Gebiete der Kommunikationstechnologie, in denen das Zusammenspiel von Sinn, Materialität und Codierung in Gestalten auftritt, die noch einen Eindruck vom Ringen und Streben vermitteln, das den allgemein akzeptierten Auffassungen von Nützlichkeit, Effizienz und Konsumentenbedürfnis zugrunde liegt. Ich möchte damit der Welt, die wir uns geschaffen haben, auf den Grund gehen und der Frage nachspüren, wie sich materielle Hilfsmittel in unsere persönlichen Beziehungen, unser Verständnis des physischen Universums und des eigenen Ursprungs sowie in unsere Zukunftsvorstellungen einschreiben.

Firebirds und *Tongues of Fire* sind zwei zusammengehörige Arbeiten, die den Machtkomplex der Beziehung zwischen Feuer und Sprache aus verschiedenen technischen, historischen und metaphorischen Blickwinkeln untersuchen. Wenn wir sprechen, zuhören, lesen und uns in den inneren Verästelungen eines Gesprächs verlieren, ist uns nicht immer bewusst, dass Sprache aus Lauten und Tönen besteht. Im 20. Jahrhundert aber haben die elektronischen Medien und vor allem das Radio das Verhältnis von Sprache und Ton in unserer Kultur neu konfiguriert. Die Verwandlung von Sprache in Signal, von

Signal in Welle, Aufnahme und Wiedergabe haben zweifellos deutlich gemacht, dass Sinn stets als Ton daherkommt, der Ton als Signal, das Signal als Geräusch und so weiter.
Nicht minder technologisch ist bei aller Macht und allem Schrecken die Entwicklung, die die Stimme politischer Führer genommen hat. Letztendlich handelt es sich dabei nur um eine Luftschwingung, eine Vertiefung in der Rille. Die Apparaturen der Tonaufnahme, -übertragung und -wiedergabe lassen das deutlich werden.
Jede Technik der Sprachübertragung hat ihre ganz eigenen technischen und sozialen Entstehungs- und Rezeptionsbedingungen. Das Telefon arbeitet in Echtzeit, ist bidirektional und privat; ein Telefongespräch stellt eine Privatsphäre innerhalb der Privatsphäre der häuslichen Umgebung her; wir fühlen uns immer noch unwohl mit Freisprecheinrichtungen und Konferenzschaltungen. Der Phonograph ermöglicht die Dosierung der Rezeption und ihre Verschiebung auf den gemeinsamen Konsum in häuslicher Umgebung. Das Radio erzwingt eine kollektive Echtzeitrezeption. Die Aufmerksamkeit richtet sich auf kein anderes Objekt als die Radiostimme, abgesehen vielleicht vom imposanten Radioschrank mit seinen still vor sich hin glühenden Röhren. Bevor es das Radio gab, war die politische Rede etwas, das außerhalb des privaten Heims auf Plätzen und in Versammlungssälen stattfand. Mit der Umwandlung von Rede in Ton, Signal, Welle und wieder zurück in Signal und Geräusch wurde das häusliche Leben politisiert. Die Stimme der Führerfiguren drang in den privaten Bereich von Heim und Herd ein und machte die vormals sakrosankte Sphäre zu einem Teil des öffentlichen Raums.
Man halte sich die Entwicklung der Funktechnik vor Augen, von den ersten Ausformungen in der Vorstellung von Physikern wie Branly, Crookes und Lodge, die sich alle ernsthaft mit Okkultismus und Geisterkommunikation befassten, über die gewerbliche Nutzung durch Marconi, die Amateurfunk-Ära, in der alle Jungs vom eigenen Kommunikationsmodul träumten, mit dem sie über räumliche Grenzen hinweg mit Freunden oder eingebildeten Geliebten reden oder ihre Bubenstreiche treiben könnten (z.B. die falschen Koordinaten der sinkenden Titanic durchgeben), das militärische Funkmonopol im Ersten Weltkrieg, das Zeitalter des Rundfunks mit seinem Höhepunkt in den 1930er Jahren, als die Stimmen politischer Führer weltweit Einzug ins private Heim hielten, die Ära des Kurzwellenradios und des Rock'n'Roll bis hin zur heutigen Drahtloswelt mit unseren Mobiltelefonen und Bluetooth-Peripheriegeräten. Dieses ganze gewaltige Nirgendwo musste doch irgendwo hergekommen sein.
Zu den frühen Erfindern gehörte ein einsamer, liebeskranker junger Mann, der 1904 in seinem bescheidenen Zimmer in New Haven nach einer durchschlagenden Neuerung in der Funktechnik suchte, die ihn reich und berühmt machen sollte. Beim Betätigen seiner Sendetaste bemerkte er, dass die Flammen der Gaslampe bei jedem Punkt und Strich auf- und abhüpften. Überzeugt, einen guten Empfänger für Hertzsche Wellen entdeckt zu haben, verfasste er mehrere Patentschriften für entsprechende Geräte. Lange bevor die Patente ordnungsgemäß erteilt wurden, erfuhr De Forest, dass die Modulation der Flammen nicht durch Funkwellen, sondern durch das Geräusch der Taste verursacht wurden, er also die Entdeckungen von LeConte und Tyndall aus den 1850er Jahren repliziert hatte. Besessen von der fixen Idee, dass die Flamme ein Empfänger für Funkwellen sein musste, machte er dennoch unverdrossen weiter. Im Anschluss an eben erst von Ambrose Fleming in England und früher schon von Elster und Geitel in Berlin durchgeführte Versuche begann De Forest, seine Experimente in Glaskolben zu verlegen und die tanzende Flamme durch Glühfäden zu ersetzen. Durch Einsicht, Beständigkeit oder schieres Glück gelangte er so im Jahr 1906 zum Audion oder zur Vakuum-Röhre, einem leistungsfähigen Verstärker, der den Funk überhaupt erst zu dem breiten Medium werden ließ, zu dem er schließlich wurde, und dazu beitrug, das elektronische Zeitalter — Fernsehen, Radar, Computer — einzuleiten, welches das 20. Jahrhundert beherrschte. De Forests Erfindung markiert übrigens einen historischen Schnittpunkt — das Zeitalter des elek-

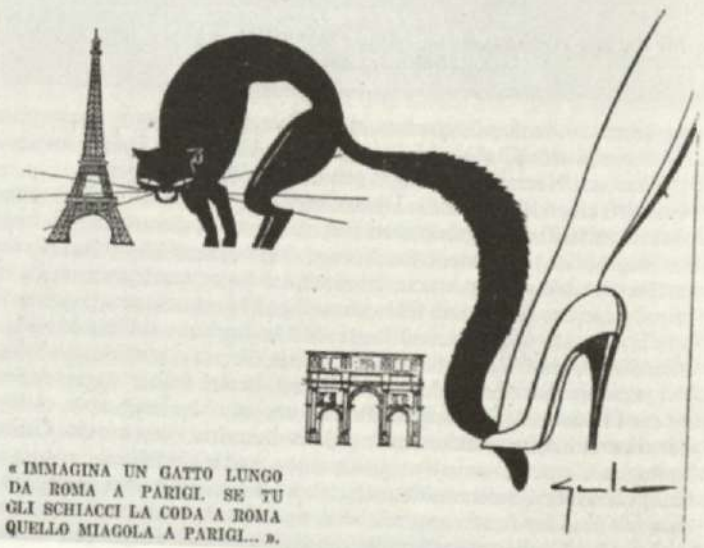


trischen Lichts —, in dem Kerzen- und Gasflammen allseits in Glaskolben eingeschlossen wurden, während umgekehrt die bisher auf Drähte angewiesenen Worte und Nachrichten den Maxwellschen Raum eroberten.
Firebirds wirft einen Blick auf die Überschneidung von Stimme, Bedeutung, materieller Inschrift und kollektivem Raum, wie er in diesem kurzen historischen Augenblick existierte. Dass Klänge durch gasgefüllte Räume transportiert werden können und nicht vibrierender fester Lautsprecherteile bedürfen, ist ein in der Elektronik früh erforschtes Phänomen. 1924 brachte die Berliner Lorenz AG Masolles und Vogts »Kathodophon« auf den Markt — im Wesentlichen eine nach außen offene Triode, die mit einem kleinen Schalltrichter versehen war und als Mikrofon diente. In den frühen 1950er Jahren kehrte der Franzose S. Klein dieses Prinzip um und beschrieb einen elektrothermischen Hornlautsprecher. 1967 publizierten drei Forscher der United Technologies Corporation in Sunnyvale einen Artikel in *Nature*, in dem sie den in *Firebirds* verwendeten elektrothermischen Schallwandler beschrieben — eine mit Kalium-Ionen angereicherte und durch wechselnde Spannungen elektrisch modulierte Gasflamme, die die Luft in Schwingungen versetzt.

Die starken Temperaturschwankungen in der Umgebungsluft der Flamme führen zur Entstehung von Schallwellen, die sich in alle Richtungen zugleich ausbreiten.
Die in *Tongues of Fire* präsentierten Stimmschriebe weisen auf eine frühere Ära im 19. Jahrhundert zurück, als Koenigs manometrische Flamme bedeutende Fortschritte in der Phonologie ermöglichte. Diese Schriebe entstehen dadurch, dass eine Gasflamme über ein in der Nähe der Gaszufuhr angebrachtes Sprachrohr in Schwingung versetzt wird. Bei der Konstruktion der Manometerkapsel folgte ich den Beschreibungen in John Tyndalls Buch *Sound*; nach dem Beispiel des später im 19. Jahrhundert agierenden Dayton Clarence Miller baute ich eine alte Balgenkamera zu einem Schlitzscanner um, um die Flammenbewegungen in Echtzeit auf einem 120 Ektachrome Rollfilm aufzuzeichnen. Solche Bilder waren die Vorläufer der späteren Oszilloskopschriebe und grafischen Darstellungen heutiger Audio-Programme. Auch für diese Arbeit wählte ich wieder politische Reden, und zwar sowohl wegen der Vertrautheit ihres Tonfalls wie als Erinnerung an die Gefahren des Feuers, selbst wenn es aus dem eigenen Lager kommt.

COME FUNZIONA LA RADIO

IMMAGINA un gatto lungo da Roma a Parigi. Se tu gli schiacci la coda a Roma quello miagola a Parigi. La radio funziona nello stesso modo.
La spiegazione, molto chiara ma non eccessivamente precisa, ha entusiasmato il pargolo, il quale ora medita su tanta scienza. Un giorno, forse, per sapere che cosa è la radio coprirà le lavagne di formole ed equazioni, integrali e curve. Perchè la radio è sovrattutto matematica ed è probabilmente la scienza più difficile tra quelle che oggi tentano l'uomo.
Non ti spaventare, amico lettore, di questa premessa.



« IMMAGINA UN GATTO LUNGO DA ROMA A PARIGI. SE TU GLI SCHIACCI LA CODA A ROMA QUELLO MIAGOLA A PARIGI... ».

Compositions and Recordings

The Appearance of Evil 2004
Instrumentation: video projections, audio recordings, screen/reflectors, Holosonics Audio Spotlight ultra-directional loudspeakers / Duration: 20:00

Torch Song 2002
Instrumentation: flame loudspeakers, manometric flames, rotating mirrors, Edison cylinder player, Zenith tube radios, helium balloons / Duration: variable

The Lecture of Comrade Stalin performance version 1997
Instrumentation: Macintosh computers, Max/MSP / Duration: 45:00 / Audio recording (excerpt) on *Ghosts & Monsters*, Leonardo Music Journal CD Volume 8 (1998)

A Rope Trick 1993
Instrumentation: motors, latex tubing, microcontroller boards, Macintosh computer, Max, Roland synths / Duration: variable

The Bach Flower Remedies 1991
Instrumentation: Macintosh computer, PC-286 computer with dual TMS320C25 DSP boards, recorded voice / Duration: 15:00

Mechanization Takes Command collaboration with Laetitia Sonami 1990
Instrumentation: Macintosh classic computers, PC-286 computer with dual TMS320C25 DSP boards, Yamaha FM synths, recorded voice, glove controllers, projected images / Duration: 1 hour / Unpublished audio recording

Vocal Variety 1989
Instrumentation: Apple II computer, TMS320C25 DSP, Yamaha TX-81Z / Duration: 4:22 / Audio recording published on *Bed of Sound*, P.S. 1. New York CD (2000) / Online publication by Textsound Issue 3 *http://textsound.org/index.php?ISSUE=3*

Songs of the Suburban Salesmen 1988
Instrumentation: Apple II computer, Micromint voice synthesis/recognition boards, Yamaha TX-81Z / Duration: 12:00 / Unpublished audio recording

I've Always Loved You 1987
Instrumentation: laser, photodetector, turntable, computer, motors, 78 rpm record / Duration: 6:29 / Audio recording published on *The Edison Effect – a Listener's Companion*, Apollo CD (1995)

Patterns of Wear 1987
Instrumentation: laser, photodetector, turntable, computer, motors, 78 rpm record / Duration: 5:38 / Audio recording published on *The Edison Effect – a Listener's Companion*, Apollo CD (1995)

Mind Power 1987
Instrumentation: Apple II computer, Micromint voice synthesis/recognition boards, Casio CZ-101 / Duration: 4:06 / Audio recording published on *False Phonemes*, Tellus Cassette #22 (1988)

I Want You 1986
Instrumentation: Apple II computer, Micromint voice synthesis/recognition boards, Yamaha FB-01 / Duration: 3:07 / Audio recording published on *Another Coast (New Works from the West)*, Music and Arts CD-276 (1988)

Beneath the Numbered Sky for resynthetised voice and computer 1985
Instrumentation: TMS320C25 DSP, Casio MT-30, voice / Duration: 16:10 / Audio recording published on *Music as A Second Language*, Lovely Music CD (1991)

Kokole for synthetic voice and electronics 1985
Instrumentation: Apple II computer, Micromint voice synthesis/recognition boards, Casio CZ-101 / Duration: 6:42 / Audio recording published on *Another Coast (New Works from the West)*, Music and Arts CD-276 (1988)

Novena for synthetic voice and electronics 1985
Instrumentation: Apple II computer, Micromint voice synthesis/recognition boards, Casio CZ-101 / Duration: 7:00 / Unpublished audio recording

Monogram 1984
Instrumentation: audio recordings, TMS32010 DSP chips / Duration: ca. 1 hour / Unpublished audio recording in Experimental Intermedia Archive

Yellow Yankee 1983
Instrumentation: hacked Speak'n'Spell, Apple II computer, Casio MT-30 / Duration: 6:00 / Audio recording published on *Music with Memory*, Tellus Cassette #9 (1985)

Eenie Meenie Chillie Beenie 1983
Instrumentation: hacked Speak'n'Spell, Apple II computer, Casio MT-30 / Duration: 4:26 / Audio recording published on *Music with Memory*, Tellus Cassette #9 (1985)

She's-a-Wild collaboration with David Behrman, Terri Hanlon, Fern Friedman 1981
Instrumentation: voice, electronic instruments, computers, piano, visual projections, props / Duration: 70 minutes / Audio recording published on Record Records 101 (1981)

Untitled collaboration with David Behrman, Takehisa Kosugi, Anne Klingensmith 1980
Instrumentation: AIM-65 computer, Kim-1 computer, custom electronic circuits, violin, voices / Duration: 50 minutes / Unpublished audio recording in Experimental Intermedia Archive

Et Tu, Klaatu 1979
Instrumentation: hacked Speak'n'Spell, AIM-65 computer, homemade guitar-like controller, electromechanically activated percussion instruments, Casio VL-Tone / Duration: 8:59 / Unpublished audio recording

If God Were Alive (And He Is) You Could Reach Him By Telephone 1978
Instrumentation: voice, tamboura, hacked Speak'n'Spell / Duration: 7:15 / Audio recording published on *Lovely Little Records*, Lovely Music 7" vinyl, LP 101-6 (1980)

Sounds and the Shadows of Sounds performance version 1978
Instrumentation: Kim-1 computer, Gentle Electric pitch follower, homemade 36 channel resonant filter bank, Radio Shack police band radio / Duration: variable / Audio recording published on *League of Automatic Music Composers 1978–1983*, New World Records CD 80671 (2007)

A Byte at the Opera collaboration with Jim Pomeroy 1976
Instrumentation: Kim-1 computer, loudspeakers, beans, Silly String, colored chalk dust, power tools, sheet rock / Duration: ca. 1 hour / Unpublished B&W video recording

Three by Three 1976
Instrumentation: instrumental ensemble, coincidence switching circuits / Duration: variable

String Quartet for Solo Viola and Digital Delay Lines 1975
Instrumentation: viola, homemade digital audio sampler/looper / Duration: ca. 20:00 / Unpublished B&W video

Three in a Row 1975
Instrumentation: homemade coincidence switching circuits, site specific ambient recordings / Duration: variable

CKT
1974

Instrumentation: homemade electronic circuits, clip leads / Duration: variable

The Streets of Laredo
1974

Instrumentation: voice, slide whistle, Buchla Music Easel synthesizer / Duration: 10:00 / Unpublished B&W video

Great Masters of Melody
1974

Instrumentation: variable instrumental ensemble, homemade electronic circuits / Duration: 4:32 / Published recording on *Just for the Record* »Blue« Gene Tyranny, Lovely Music LP, LCD 1062 (1979)

In Sara, Mencken, Christ and Beethoven there were Men and Women collaboration with Robert Ashley
1974

Instrumentation: voice, Moog synthesizer / Duration: 40:00 / Published Cramps LP, republished Cramps CD, republished Lovely Music CD 4921 (2002)

The Pygmy Gamelan
1973

Instrumentation: homemade electronic circuits / Duration: indefinite length (as long as the electronics last) / Published recording titled »Forest Booties« (10:45) on *Lovely Little Records*, Lovely Music 7" vinyl, LP 101-6 (1980)

Protection Music
1971

Instrumentation: tape composition with Moog synthesizer sounds / Duration: 4:00 / Unpublished audio tape

Published Solo Recordings

The Edison Effect A Listener's Companion, Apollo CD 039514
1995

The collection forms part of the laser disk series of sound sculptures/electromagnetic devices which play ancient phonograph records with laser beams (editors: Paul DeMarinis, Paul Panhuysen).

Mary	2:55
March (i)	1:57
Mary (wax cylinder)	2:05
Mary (machine whisper)	0:07
Etaion Shrdlu (wax cylinder)	2:09
Edison's Piano	11:18
Talking Doll	0:30
March (ii)	1:49
Pathé Discs	6:04
Loving/Dying – The Unrequited Quark	2:18
Fragments of Jericho	1:49
Grand Canyon (Patterns of Wear)	5:38
I've Always Loved You	6:29
March (iii)	2:18
Lesson 2 – Italian/English	3:26
Trentesima Lezione	2:00

Music as A Second Language Lovely Music CD 3011
1991

Speech melodies extracted from sources as various as language instruction recordings, hypnotists and televangelists are resynthesized and applied to digital musical instruments. (Titles from this collection were performed live during the years 1986–1992)

Leçon par l'aiguille (1988)	2:53
Fonetica Francese (1989)	3:59
An Odd Evening (1988)	3:13
An Appeal (1990)	4:25
The Sand Clock (1989)	2:56
Cincinnati 1830–1850 (1990)	6:14
The Power of Suggestion (1990)	9:17
Beneath the Numbered Sky (1986)	16:10

Performances / Venues

2004 **The Appearance of Evil**
Disney Redcat Theater / Los Angeles [CA/US]

2003 **Torch Song**
Galerie Metronom / Barcelona [ES]
Teatro CAM / Alicante [ES]

Untitled collaboration with Fabrice Gallis
De Puddingfabriek / Groningen [NL]

2002 **Torch Song**
San Francisco Museum of Modern Art / San Francisco [CA/US]
Beyond Baroque / Los Angeles [CA/US]

2001 **The Lecture of Comrade Stalin** performance version
Mills College CCM / Oakland [CA/US]

Events with Merce Cunningham Dance Company
Tour in Perth [AU], New York [NY/US], Berkeley [CA/US], Madrid [ES], London [GB]

2000 **Events** with Merce Cunningham Dance Company
Tour in Glendale [CA/US], Ba'albek [LB], Barcelona [ES], Vienna [AT], London [GB], Madrid [ES]

The Pygmy Gamelan
Whitney Museum of American Art / New York [NY/US]

1999 **Events** with Merce Cunningham Dance Company
Tour in Los Angeles [CA/US], Berlin [DE], Friedrichshafen [DE], Torino [IT]

The Lecture of Comrade Stalin – Synthesis
Musiques 1999 / GMEM / Marseille [FR]

1998 **Events** with Merce Cunningham Dance Company
Tour in Berkeley [CA/US], Tempe [AZ/US]

The Lecture of Comrade Stalin
Audio Art Festival / Warsaw [PL]

1997 **The Lecture of Comrade Stalin** and **A Rope Trick**
Open Systems Festival / Dortmund [DE]

1996 **Events** with Merce Cunningham Dance Company
New York [NY/US]

Ocean with Merce Cunningham Dance Company
Berkeley [CA/US]

1995 **A Rope Trick**
IAMAS / Ogaki City [JP]

1994 **Songs for Synthetic Voices**
Neslon-Atkins Museum of Art / Kansas City [MO/US]

1993 **A Rope Trick / Que Onda!**
Obscure / Quebec [CA]
Laboratorio de Informatica Musical / Guanajuato [MX]
Theater X / Tokyo [JP]

1992 **Songs for Synthetic Voices**
T.I.S.E.A / Sydney [AU]

1991 **Mechanization Takes Command** collaboration with Laetitia Sonami
Ars Electronica / Linz [AT]
Het Apollohuis / Eindhoven [NL]

The Bach Flower Remedies
The Kitchen / New York [NY/US]

Songs for Synthetic Voices
New Langton Arts / Opcode Systems / San Francisco [CA/US]
Electronic Music+19 Festival / Oakland [CA/US]
Harvestworks / New York [NY/US]
Wesleyan University / Middletown [CT/US]

1990 **Songs for Synthetic Voices**
Sonic Disturbance / Cleveland [OH/US]
ArtWare / Hannover [DE]

Mechanization Takes Command collaboration with Laetitia Sonami
New Langton Arts / San Francisco [CA/US]
Experimental Intermedia / New York [NY/US]
The Lab / San Francisco [CA/US]

1989 **The Power of Suggestion** and other new songs for synthetic voices
Headlands Center for the Arts / Sausalito [CA/US]
Composers Forum / New York [NY/US]
Logos / Gent [BE]
Het Apollohuis / Eindhoven [NL]

1988 **I Want You, Kokole, Novena** and other songs for synthetic voices
Composer-to-Composer / Telluride [CO/US]
Intersection for the Arts / San Francisco [CA/US]

1987 **Patterns of Wear, Mind Power** and **I've Always Loved You**
New Langton Arts / San Francisco [CA/US]
Speaking of Music / San Francisco [CA/US]

1986 **Beneath the Numbered Sky, Kokole, Novena** and performance version of **The Music Room**
Eiszeit Kino / Berlin [DE]
Shaffy Theatre / Amsterdam [NL]
Het Apollohuis / Eindhoven [NL]

1985 **Novena, Kokole** and other songs for synthetic voice
Roulette / New York [NY/US]
New Music America / Los Angeles [CA/US]
Samaya Foundation / New York [NY/US]

1984 **Monogram**
Experimental Intermedia / New York [NY/US]

1983 **Eenie Meenie Chillie Beenie, Yellow Yankee** and other songs for synthetic voice
Lovely Music Live / New York [NY/US]
P.A.S.S./Harvestworks / New York [NY/US]
New Langton Arts / San Francisco [CA/US]
Axiom Axiom / San Francisco [CA/US]

1982 **Music Room** performance version
Seibu Dept. Store / Tokyo [JP]
NHK Television / Tokyo [JP]

Et Tu, Klaatu
New Music America / San Francisco [CA/US]
Danceteria / New York [NY/US]

1981 **She's-A-Wild** collaboration with David Behrman, Terri Hanlon, Fern Friedman, Anne Klingensmith
New Performance Gallery / San Francisco [CA/US]
Creative Music Studio / Woodstock [NY/US]
The Kitchen / New York [NY/US]

1980 **If God Were Alive (& He Is) You Could Reach Him By Telephone** and other songs for electronics and space
Real Art Ways / Hartford [CT/US]
Wesleyan University / Middletown [CT/US]
P.A.S.S./Harvestworks / New York [NY/US]

Untitled collaboration with Takehisa Kosugi, David Behrman, Anne Klingensmith
Experimental Intermedia / New York [NY/US]

Untitled collaboration with David Behrman
The Exploratorium / San Francisco [CA/US]

1979 **If God Were Alive (& He Is) You Could Reach Him By Telephone** and other songs for electronics and space, with Anne Klingensmith (voice)
Festival d'Automne / Paris [FR]
Whitworth Art Gallery / Manchester [GB]
Media Studies / Buffalo [NY/US]

1978 **A Byte at the Opera** collaboration with Jim Pomeroy
U.C. Santa Barbara / Santa Barbara [CA/US]
L.A.I.C.A. / Los Angeles [CA/US]

Untitled collaboration with Nic Collins, Ron Kuivila, Stuart Marshall, Alvin Lucier
The Kitchen / New York [NY/US]

1977 **A Byte at the Opera** collaboration with Jim Pomeroy
80 Langton St. / San Francisco [CA/US]

Séance with Kim-1 with Constance de Jong (voice)
The Kitchen / New York [NY/US]

1976 **CKT**
Museum of Modern Art / San Francisco [CA/US]

Rainforest IV collaboration with David Tudor and Composers Inside Electronics
Festival d'Automne / Paris [FR]

String Quartet for Solo Viola and Digital Delay Lines with Martin Kalve (viola)
Festival d'Automne / Paris [FR]

String Quartet for Solo Viola and Digital Delay Lines with David Behrman (viola)
Mills College CCM / Oakland [CA/US]

Three by Three
S.F. Conservatory of Music / San Francisco [CA/US]

1975 **Three in A Row**
Margaret Jenkins Studio / San Francisco [CA/US]
Washington Project for the Arts / Washington [DC/US]

Great Masters of Melody
Finnish Hall / Berkeley [CA/US]

1974 **The Pygmy Gamelan**
WBAI Free Music Store / New York [NY/US]
Wesleyan University / Middletown [CT/US]

CKT
South of the Slot / San Francisco [CA/US]

The Streets of Laredo collaboration with Jim Pomeroy (voice)
1750 Arch St. / Berkeley [CA/US]

1973 **P.L.L. Bach** with Rae Imamura (keyboard)
Mills College CCM / Oakland [CA/US]

1972 **Protection Music**
Mills College CCM / Oakland [CA/US]

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Barry Willis, »Making Beautiful Noise – Paul De Marinis' Sound Machines,« in: *LIMN Magazine of International Art & Design*, vol. 1, no. 4 (1999), pp. 24–29.

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1995

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- *singuhr – hoergalerie in parochial 1996–2006*, Berlin, 2009
- *Höhenrausch*, OK Centrum für Gegenwartskunst, Linz, 2009
- *Audioframes* 2002–2007, Happy New Ears & Bazar, Kortrijk/Lille, 2007
- *CyberArts 2006*, Prix Ars Electronica, Linz, 2006
- *2006 Shanghai Biennale*, Shanghai, 2006
- *Festival Archipel '04*, Geneva, 2004
- *MaerzMusik 2003*, Berliner Festspiele, Berlin, 2003
- *Manif D'Art 2: Bonheur et Simulacres*, Manifestation internationale d'art de Québec, 2002
- *Resonanzen*, Stadtgalerie Saarbrücken, 2002
- *MicroWave International Media Arts Festival*, Videotage, Hong Kong, 2002
- *Nam June Paik Award 2002*, NRW-Forum Kultur und Wirtschaft, Düsseldorf, 2002
- *CyberArts 2001*, Prix Ars Electronica, Linz, 2001
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- *Bits & Pieces: Shifting Boundaries and Different Realities*, Joseloff Gallery, Univ. of Hartford, 2001
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- *SECA Media Awards*, SFMOMA, SanFrancisco, 1996
- *Klangkunst*, Akademie der Künste, Berlin, 1996
- *Scattering Matrix*, Richard Heller Gallery, Los Angeles, 1996
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- *New Music America*, SanFrancisco, 1981
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- Technorama, Winterthur [CH]
- Alan Chasanoff, New York City [NY/US]
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- Rene Di Rosa, Napa [CA/US]
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Fred Turner
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